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This Week in The IRON AGE

Vol. 155, No. 14 — April 5, 1945

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When Dreams Come True

A LITTLE over two years ago I dreamed a dream but at that time I could not forsee its materialization. However, since the editorial page of The Iron Age is not bound, like the remainder of this journal, to the purely objective disclosure of facts, my dream slipped into type on March 18, 1943, under the title "Co-education in Economics."

The thought expressed was that management and labor in our modern economic world really have many more things in common upon which they can cooperate for mutual benefit than points of difference. Objectives, if you please, that can only be reached by working together and which cannot be reached by fighting each other.

Labor, for example, profits as does management from more goods for more people at lower prices. A reduction in the price of housing or food or shoes or automobiles means much more to the man earning $30 or $40 per week than to the man earning ten times that much. A thousand times more shoes and automobile tires are worn out in the process of walking or riding to jobs at machines in factories or to counters in stores than by walking or riding to executive offices or stock-holders' meetings.

So management and labor both have a stake, and a most important one, in cost reduction and in increasing productivity. There is no other really practical way than these to get that increased purchasing power that we shall soon be looking for and that means more goods for more people and more jobs for them.

Although a seemingly indirect factor, but none the less a most direct influence, bearing on this is the matter of economy in government as expressed in tax reduction. Individual income taxes are now as great, if not greater, in total volume than are corporate taxes. And since 85 per cent or more national income is in the individual income of wage earners, it is evident that American labor has a much greater stake in postwar government economies than has ownership.

Ownership as represented by management is really working together in a common orchard. The fruit that it raises is the fruit of enterprise. That fruit is the sole means of economic sustenance for all parties and the only point of difference between them should be the relative share of each.

Unfortunately this fundamental truth is overlooked by a great many people both of management and of labor. For the majority of our strikes and labor disputes are not over wages but over inconsequential and easily rectifiable causes to men of open mind and good will.

These things, I believe, are caused by a lack of understanding of fundamental economics by many of our managers and our labor leaders. For in the long run both need more apples from the orchard.

So in my dream of two years ago as put into type on this page, I said:

"Our future managers and labor leaders alike will be largely college graduates. It would be a good thing if they could go to school together, learn what the fundamentals are on which they can and should agree and how to settle that on which they cannot agree with the least possible friction."

It augurs well for our postwar labor relations outlook that such universities as Cornell and Harvard have recently announced the formation of courses designed for this very purpose.

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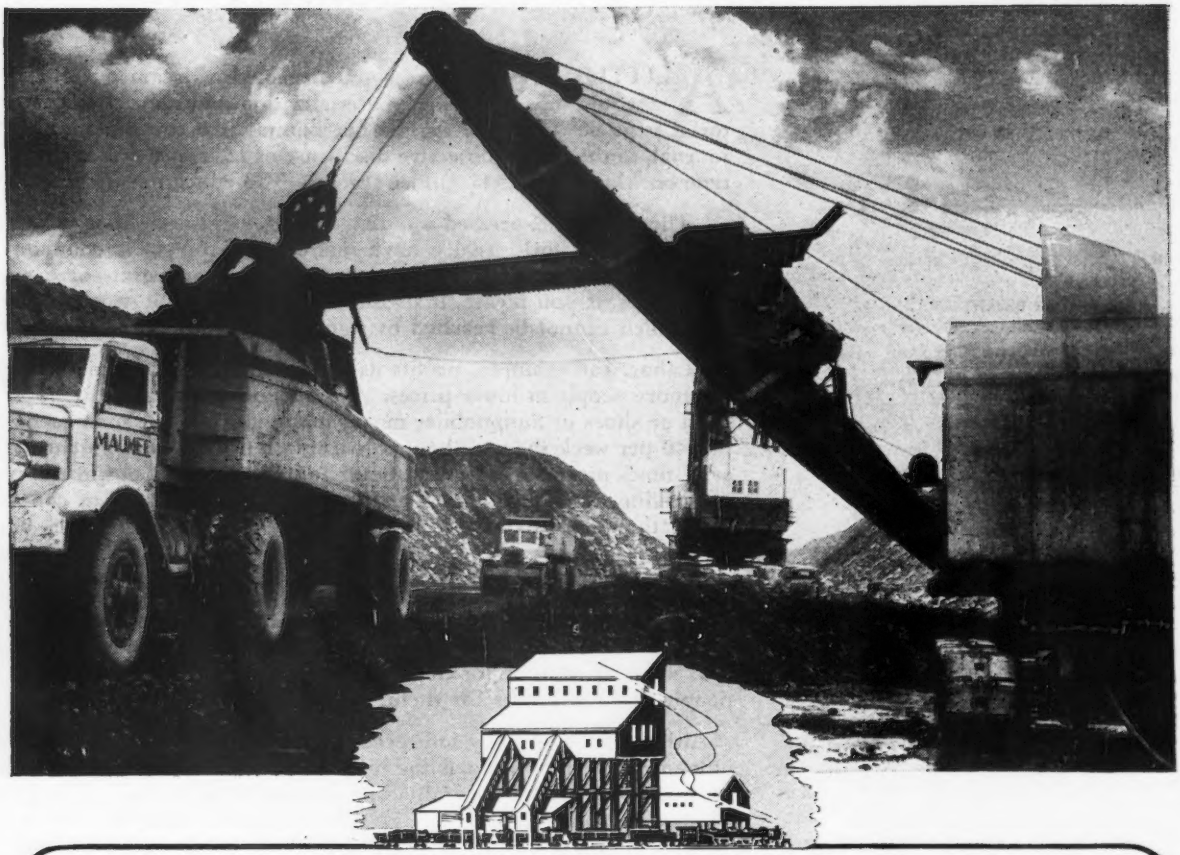

Inland Hi-Steel buckets, truck bodies, screens, chutes, etc., are giving many times the service obtained from other steels.

HI-STEEL LASTS 12 TIMES LONGER

The facts behind this story of lower maintenance costs began six years ago when Inland Hi-Steel replaced mild steel for buckets, truck bodies, chutes, screens, and conveyors in the tipple at Maumee Collieries.

The mine records indicate that mild steel failed every 5 to 6 months, due to the abrasive action of the coal. The same records show that Inland Hi-Steel, with its high resistance to abrasion in this type of service, has been in use for over 6 years without a single replacement . . . and that it is still going strong.

After the first year, when the higher cost of Inland Hi-Steel was paid through savings, every ton of coal that traveled down the chutes, through the screens and over the conveyors was handled at less cost.

Inland Hi-Steel is not only abrasion and corrosion resistant, but its high-strength means weight saving as well. It is doing many important war and peace jobs where these favorable characteristics mean savings in time, labor and materials. Write for the Inland Hi-Steel Bulletin.

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The IRON AGE
April 3, 1945

NEWS FRONT

► Donald A. Douglas, conservative aircraft builder, is calling on the government to solve the industry's problems. Behind his appeal is the fact that harsh interpretation of certain existing regulations might ruin any or all of the aircraft firms.

► Ohio employers this week faced a dilemma as wartime legislation permitting overtime work for women lapsed, and legislative delays prevented reinstatement. Existing law limits the work week to 45 hours, when some women are actually working 84 hours.

► The next issue of Air Force, the official service journal, will again scoop the nation's press, this time with announcement of the existence of the P-47N, super long range version of the Thunderbolt, and the P-51H, stripped-down high performance fighter.

► Army Air Force officers, assigned prematurely to contracts settlement work last fall, have been marking time while the War Department "de-emphasized" reconversion. VE-day cutbacks will send these men back to work.

► British writers state that a jet plane could be arranged before the war ends to fly across the ocean. Such a design, with maximum fuel capacity, would admittedly not be of a combat type as conceived today.

► Recognition of foremen's right to organize by the NLRB will touch off an immediate organization drive in Detroit, where the Foreman's Association of America was active before the adverse court decision of 1943.

► Broad insurance coverage for its member workers will be asked for by the United Automobile Workers, CIO. The plan calls for the setting aside of a sum equal to three per cent of each worker's pay for a social security fund. This three per cent would not be a deduction from pay envelopes, but would be a contribution by management. The fund, however, would be administered by the union.

Opposition to this proposal, which will first be introduced to General Motors, will probably be based on wage stabilization since in effect this would act as a wage advance.

► The Chesapeake & Ohio Railway has asked WPB for permission to build three coal burning locomotives of a type designed to use in combination steam, turbine and electric drive.

At present no electrically driven locomotive powered by steam turbine is in operation in this country. Basic designs which have already been completed by Baldwin call for the development of 6000 hp., delivered from a turbine to generators for the electric motors which drive the wheels. The locomotive will be capable of running more than 100 miles an hr. under full load with high sustained speeds even on grades.

► Preparations are under way for restoration of East Indian rubber plantations using all available military as well as civilian labor as soon as the territory is occupied. Orders for buckets, possibly to be made of aluminum, to collect the rubber sap, are in the number of 25 millions.

► Late wartime construction will be in warehouses for the display and disposal of surplus goods. Contracts are now being let for this construction, localizing certain items in their most favorable market areas.

► Pressure in the postwar private plane field is increasing as Aeronca buys the rights to a spinproof craft, Piper announces its postwar single place model and a four place family sedan, and William Stout, affiliated with the Consolidated-Vultee organization, exhibits photos of a controllable wing plane of a new design which appears to be of a roadable type.

► The steelworker's union as bargaining agent for employes of 20 plants of the Aluminum Co. of America has obtained shift differential increases in place of an across-the-board 15c an hr. increase as requested. The order is retroactive to May 1, 1944.

Spot Welding Of Magnesium Alloys

. . . Optimum machine settings on two types of stored energy welders have been worked out experimentally for various gages of magnesium alloys. In an attempt to improve shear strength values and their consistency a chemical precleaning technique has been developed that is superior to wire brushing in many respects. The relative effectiveness of chemical protective finishes applied after spot welding has also been studied. These latter two phases are covered in the concluding part of the article to follow.

By KENNETH E. DORCAS
Research Laboratory Analyst
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APPLICATIONS of magnesium are generally designed to take advantage of its light weight so a welding process in which the additional weight of welding rod is not required is a desirable means of fabrication. Spot welding is rapid and requires neither welding rod nor flux, absence of which reduces the possibility of corrosion of magnesium due to inclusions. It has long been known that magnesium alloys can be spot welded. However, in considering the possibility of using this method of fabrication for aircraft parts, it was necessary to determine whether the existing stored energy type welding equipment would produce strong and uniform welds. In this connection test strips of several magnesium alloys, in varying thicknesses, were welded with a range of control settings on three different spot welding machines to determine optimum operating conditions.

Tests of several methods of chemical precleaning of magnesium alloys were also conducted and the relative effectiveness of each was compared with the others and with conventional mechanical precleaning. This was done with the aid of a surface resistance meter, based on the premise that good spot welds and low surface electrical resistance go hand in hand. By this means it was possible to develop a chemical precleaning process to prepare magnesium alloys for spot welding that is superior in certain respects to mechanical cleaning. Studies were also made of the relative effectiveness of recognized chemical and electrochemical protective finishes after welding.

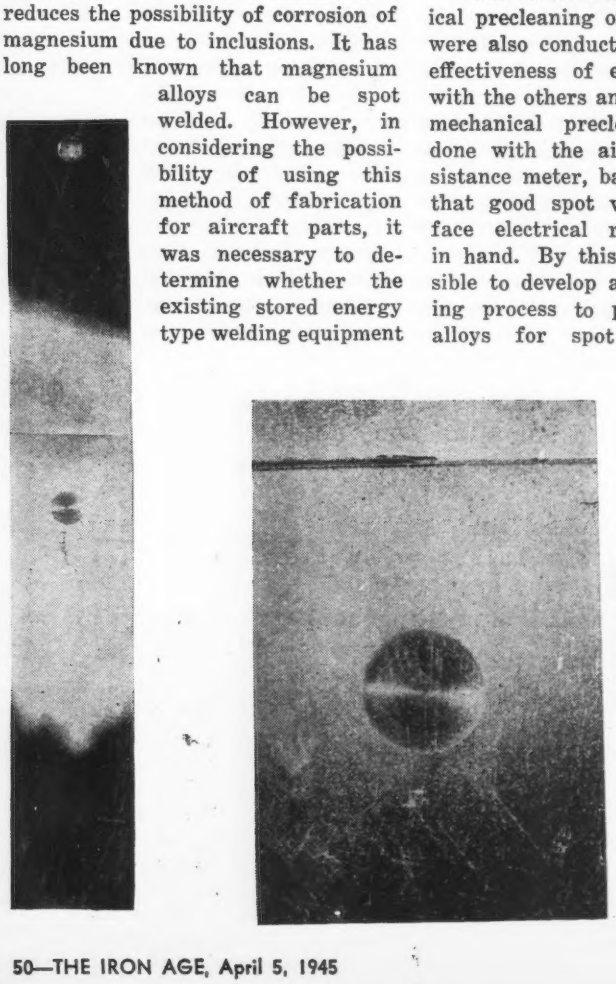


FIG. 1—Typical specimen of 0.020 gage AMC 52S-H magnesium alloy welded on a Sciaky machine. At right is a photomacrograph of the spot weld surface.

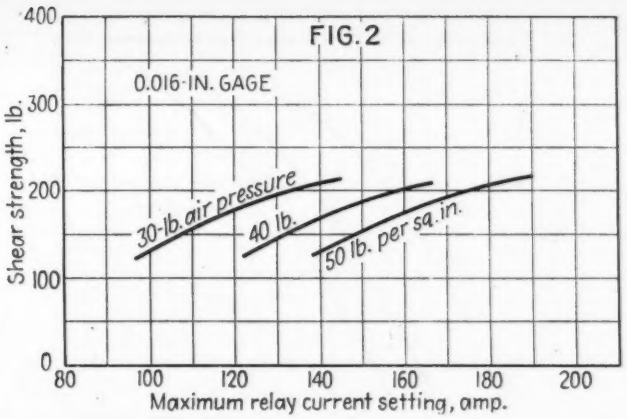
The major portion of the specimens tested were made from American Magnesium Co. alloys, particularly AMC52S-H, of gages ranging from 0.0616 to 0.125 in. However, other alloys were tested, AMC52S-O, AM3S-H AM3S-O and AMC57S-H, and J-1h and Fs-la, the latter two produced by Dow Chemical Co.

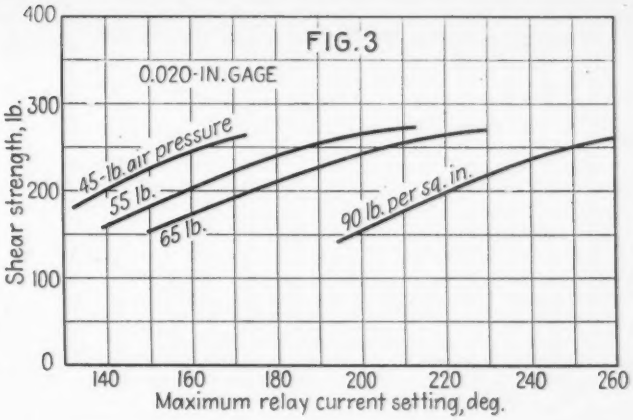
Specimens for the spot weld tests consisted of 1 x 4 in. sheets overlapped 1 in. and welded with a single spot. A typical spot weld test specimen is shown in Fig. 1. All the strips were cleaned with a wire brush before being welded except those specimens used later in conjunction with the development of the cleaner. The wire brush used for cleaning specimens was of 0.003 in. stainless steel wire in a 6 in. wheel operating at 3450 r.p.m. The decrease in thickness of the magnesium alloy sheet after the wire brush cleaning was negligible when measured with a micrometer. Three spot welding machines were used in this test: Sciaky type PMCO 2S16 and Taylor-Winfield, type AWH 363 C2 and type HWR 345DT. These three machines are d.c. spot welders.

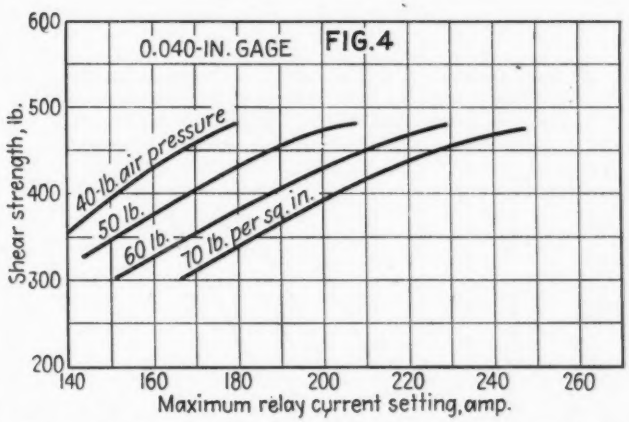
The available settings on the Sciaky type PMCO 2S16 machine were as follows:

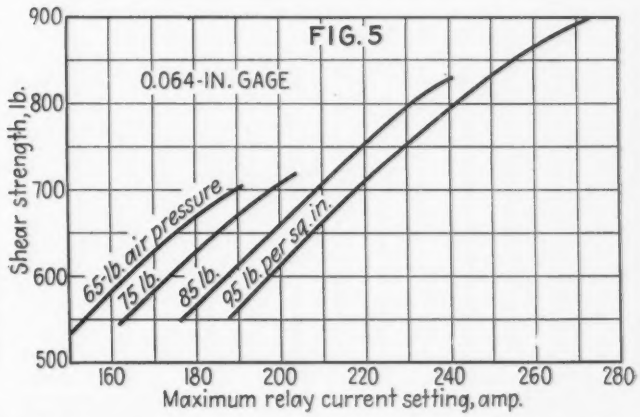
Voltage .....Two steps—80 or 155 volt
Maximum relay current—100 to 300 amp.
Cycle controls
Charging delay time
Recompression time
4 or 8 poles
Precompression, with or without
Pressure, constant or variable
Cylinders, 1 or 2

To determine the optimum cycle settings, a number of wire-brushed test strips were welded using various settings of the time cycle control. While the time cycle control settings are not critical, their values do affect the pressure and current settings. The following data represent the best machine settings tested for spot









FIGS. 2-5—Experimental data showing relation of spot weld shear strengths to maximum current relay settings on Sciaky type PMCO 2S16 reactor machine at various air pressures. The material is all wire brushed AMC52S-H magnesium alloy of the gages indicated.

welding 0.016 to 0.040 in. gage AMC 52S-H, using ⅝ in. electrodes:

Voltage	80
Charging delay, cycles	40
Recompression time, cycles	40
Poles	4
Precompression	off
Pressure	constant
Cylinders	1

To determine the optimum pressure and current settings for a given gage of alloy, the Sciaky spot weld machine was set for the best time cycle, and an arbitrary air pressure was used. A series of test welds were made varying the maximum current relay from a value that was too low to produce a weld, to an excessive current that caused spits or cracks. Within this range were values of current that produced usable and acceptable welds of reasonable strength. This procedure was repeated for other values of air pressure, three or four air pressures being tried for each gage of alloy. The air pressure was varied in increments of 10 lb. per sq. in. These test specimens were then pulled on a Tinius Olson 2000-5000 lb. testing machine and their shear strengths plotted against maximum current relay settings. The air pressure that permitted the greatest range of current setting without causing excessive indentation was selected as the best to use.

Figs. 2 to 6 show the graphs for 0.016 to 0.064 in. gage AMC52S-H material as welded on the Sciaky machines using ⅝ in. electrodes. The lower portion of the curves for low current settings given no welds or unreasonably weak welds is not shown. The top of the curves indicates the points where spitting and cracking occurred. Welds were also made using higher values of current, but since such welds could not be used, this portion of the graphs was also omitted.

The selection of the best air pressure was based on using the highest pressure possible without causing excessive indentation or distortion of the surface of the alloy. The higher air pressures gave a greater operating range of current settings, and also tended to reduce sticking and burning. The recommended air pressure is shown in Table I for each gage of AMC52S-H alloy and is charted in Fig. 6.

The available settings on the Taylor-Winfield Hi-Wave capacity type stored energy machines were as follows:

Type AWH 363C2
Voltage .....100 to 2700 volts
Capacity .....600 to 1200 microfarads
Cycle .....Variable but not calibrated
Type HWR 345DT
Voltage ..... 100 to 2700 volts
Capacity .....200 to 550 microfarads
Cycle .....Variable but not calibrated

The ⅝ and ⅞ in. diameter copper electrodes normally used to weld aluminum alloys were used during

TABLE I

Optimum Sciaky Machine Settings (Type PMCO 2S16)

Gage AMC52S-H In.	Air Pressure Lb./Sq. In.	Current		Minimum Shear Strength-Lb.
		Amp. Max.	Amp. Min.	
0.016	50	130	170	150
0.020	55	145	190	200
0.040	70	195	245	375
*0.064	85	240	280	680

* 0.064 gage material was difficult to weld on the Sciaky machine without the formation of cracks in the fuse zone.

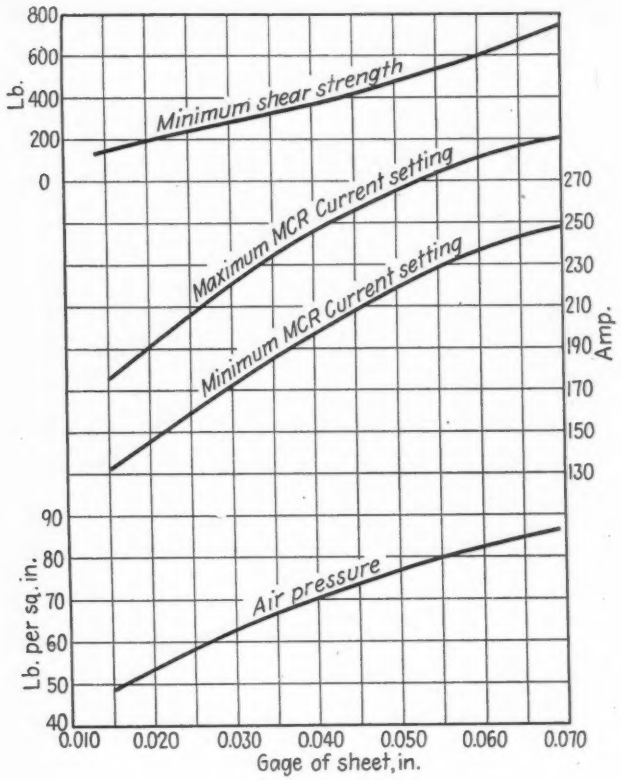


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FIG. 6—Relation of Sciaky machine settings to gage of wire-brushed AMC52S-H magnesium alloy.

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FIG. 8—Data similar to that plotted in Fig. 7 except that gage is 0.091 in. and machine capacity setting, 4320 mfd.

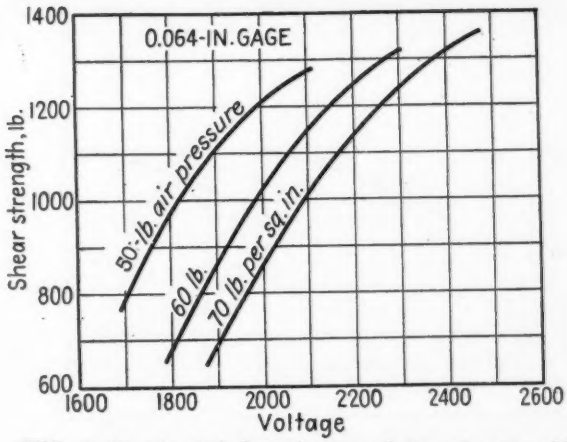
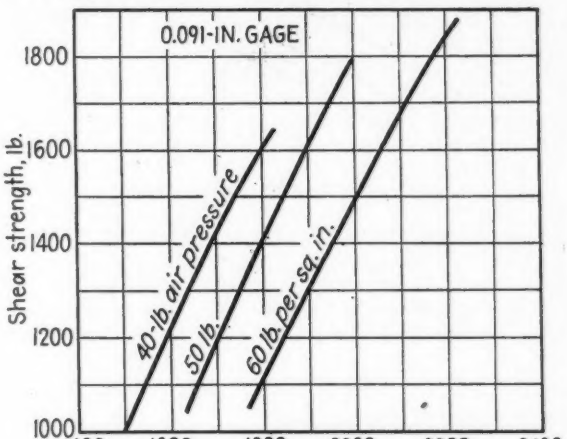


FIG. 7—Experimental data showing relation of spot weld shear strengths to voltage settings on Taylor-Winfield type HWR-345DT machine with 3240 mfd. capacity settings, in welding wire-brushed 0.064 in. gage AMC52S-H alloy.



this test. Unfortunately no ready means were available to form and maintain constant contour on the surface of the electrodes. This situation caused considerable difficulty in making definite determinations.

The air pressure was set on an arbitrary value and the voltage varied from too low a value to an excessive value similar to the method used on the Sciaky machine. However, additional series of tests were made varying the capacity settings. These test specimens were pulled for shear strength and their curves plotted in Figs. 7 and 8.

The curves for various capacity settings for the Taylor-Winfield machines are not shown since a variation in the capacity mainly shifts the voltage setting as both contacts derectly affect the current strength. Hence Figs. 7 and 8 show the shear strength vs. voltage curves for one capacity only for each gage. Table II gives the recommended settings as taken from these curves in a manner similar to those obtained on the Sciaky machine, using ⅞ in. electrodes.

Minimum Shear Strength

The minimum shear strength for a given gage was determined empirically by inspecting the shear strength vs. current or voltage curves. The minimum shear strength is the lowest permitted value for a production spot weld on a given gage and alloy. These values were determined by backing away from the top of the curves 40 to 50 amp. for the Sciaky machine settings and 300 to 500 volts on the Taylor-Winfield machine settings. These values should be equivalent to those given for magnesium alloys in Specification 20011-C which covers all the alloys.

Table III summarizes the minimum shear strengths as determined in these tests. Some values for alloys other than AMC52S-H are given, although not all the gages for these alloys were available.

Visual examination was made of the surface of the welds for excessive indentation, spits, cracks, existence of burns or the pickup of electrode material on the surface of the button. Microscopial examination was made of the etched cross-sections of the weld to determine size and shape of the fused zone and the existence of interior cracks and inclusions.

Figs. 9 and 10 show the photomicrographs of the etched cross-section of the spot weld specimens. All of these specimens were made with

TABLE II

Optimum Settings for Taylor-Winfield Type HWR 345DT Machine

Gage AMC52S-H	Air Pressure Lb./Sq. In.	Capacity Mfd.	Voltage	Minimum Shear Strength-Lb.
0.064	60	3240	1900-2000	660
0.091	65	4080	2000-2200	1030

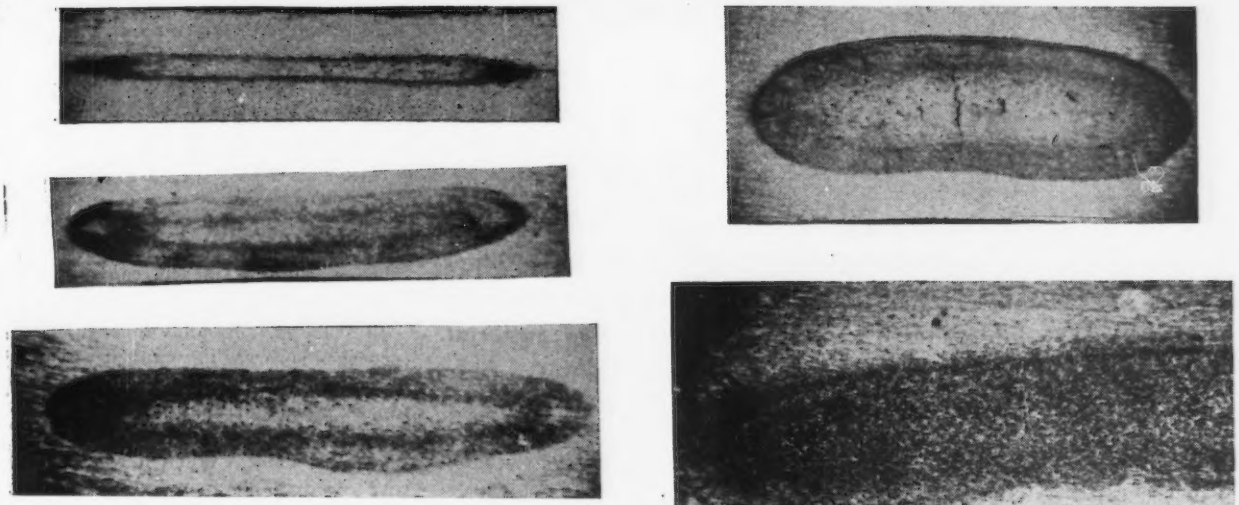


FIG. 9—Photomicrographs of etched sections of AMC52S-H magnesium alloy spot welds made on Sciaky machine.

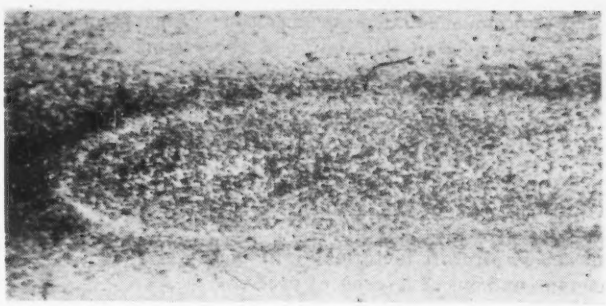


FIG. 10 — Photomicrographs of etched sections of AMC52S-H magnesium alloy spot welds. The cracks shown in the 0.064 in. gage material welded on the Sciaky machine are typical.

the recommended spot weld machine settings previously given in Tables I and II. It should be noted in Fig. 10 that the welds on the 0.064 AMC52S-H alloy, made on the Sciaky machine, were usually cracked within the fused zone, although they appeared sound on the outside and had good shear strength. It was for this reason that the 0.064 and 0.091 in. gage tests were made on the Taylor-Winfield type HWR 345 DT machine.

A complete description of the theory and practice of spot welding cannot be given here but mention should be made of the factors that determine the strength of a weld, namely:

(1) Current strength
(2) Current dwell (current time cycles)
(3) Pressure of electrodes
(4) Contour of electrode tip
(5) Surface resistance
(6) Thickness of material
(7) Electrical resistivity of welded material
(8) Heat conductivity of welded material
(9) Heat conductivity of electrode
(10) Thermal coefficient of expansion of material

For a given gage of a given alloy, items 1 through 5 remain as variables. There are several factors that affect the current strength other than the current settings on the machine:

(1) Pressure
(2) Electrode contour
(3) Arm separation and distance of electrodes from transformer

It was impossible to record and establish exactly these effects during the tests. (Each individual operator dresses the electrodes tip to a slightly different contour even of the same type). Hence, the shear strength curves, Figs. 2-8, cannot be duplicated exactly. However, as the object was to establish the best machine settings for spot welding magnesium alloys, these curves supply data to establish the recommended pressures and minimum shear strength. Any change in the setup that affects the current strength will shift the curves as a body to the right or left. The general practice of using a current or voltage setting that is just below that which causes spits or cracks places the operation near the top of the curves.

It is often desirable to express the spot weld machine settings in terms of actual electrode current and pressure. Such information cannot be derived from the machine settings themselves due to the dependency of the current upon the factors as listed above. Therefore, a separate calibration of the machine must be made. This was conducted on the Sciaky machine, as shown below:

Max Relay Current Setting, Amp.	Electrode Current, Amp.	Electrode Pressure, Lb./Sq.In.
100	20,900	24,000
150	25,900	24,900
200	30,250	24,000
100	19,800	30,900
150	24,800	30,000
200	28,600	30,900

These values were obtained while welding 0.064 gage wire-brushed AMC52S-H alloy.

(In the second and concluding part of the article the authors will describe experiments with a large number of chemical cleaning agents before a suitable one was developed that gave a surface resistance on magnesium comparable to wire brushed specimens.)

TABLE III

Summary of Spot Weld Minimum Shear Strengths, in Pounds, on Various Magnesium Alloys

Gage	AMC52S-H	AMC52S-O	FS-1a	AMC57S-H	J-1h	AM3S-O	AM3S-H	Spec. 20011-C**
0.016	150	....	....	....	....	....	....	....
0.020	200	....	....	210	....	....	....	75
0.025	240	....	....	....	....	....	....	106
0.032	300	300	....	....	....	170	....	155
0.040	375	....	300*	....	400	250	....	202
0.051	500	....	....	....	....	....	....	270
0.064	660	....	....	....	....	400	....	380
0.081	900	....	....	....	....	....	....	470
0.091	1030	....	....	....	....	....	....	540
0.125	1600	....	....	....	....	....	....	....

* All of these alloys were very easily welded except Fs-1a which was welded only with great difficulty.
** Specifications 20011-C covers all of the alloys and therefore the minimums is that expected of AM3S-O.

Conveyorized Equipment for Finishing

. . . Increased processing capacity for cleaning and finishing aluminum, magnesium and steel parts amounting to over 800,000 per week has been attained by a continuous overhead monorail conveyor with appreciable saving in space, manhours and material.

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and D. D. WILLIAMS
Material and Process Engineering Department,
North American Aviation, Inc.,
Inglewood, Cal.

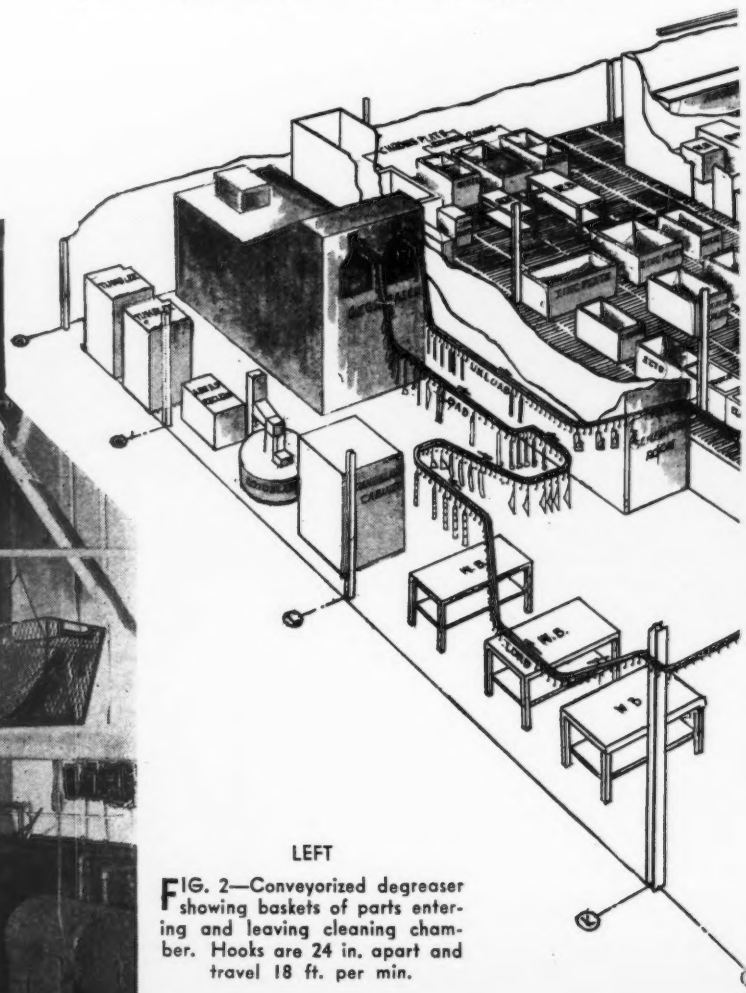
EARLY installation of conveyorized equipment for cleaning and finishing many of the numerous detail parts that go to make up the structure of a finished airplane has contributed largely to the ability of the Inglewood Division of North American Aviation, Inc., to meet an ever-increasing wartime production schedule—a schedule which recently exceeded 550 P-51 Mustang fighter planes for one month. Much of the tedious work that is ordinarily performed in aircraft factories by lifting parts in and out of a series of processing tanks is now taken care of automatically after the parts are attached to a continuous overhead monorail conveyor.

Generally speaking aircraft steel parts are cadmium or zinc plated, magnesium parts are chemically coated and painted and aluminum parts are painted with zinc chromate primer to protect them from corrosion. Careful preparation of the surface of the parts prior to application of the finish coatings is necessary to obtain satisfactory adhesion of the protective film. But when over 800,000 parts per week must be processed this becomes a labor consuming job by conventional procedures.

In 1942, as it became apparent that increased processing capacity would be needed to avoid bottlenecks in the processing department, industrial engineering made a complete survey of this department. When it was shown that appreciable savings in space, manhours and materials could be effected, three conveyorized cleaning machines—a mechanical trichlorethylene spray degreaser, a spray chromatizer and a stringer cleaning machine—were purchased. The general location of these machines in the department is shown in Fig. 1.

The degreaser selected was a steam-heated Detrex vapor-spray-vapor de-

FIG. 1—Perspective drawing of processing department showing general location of equipment.



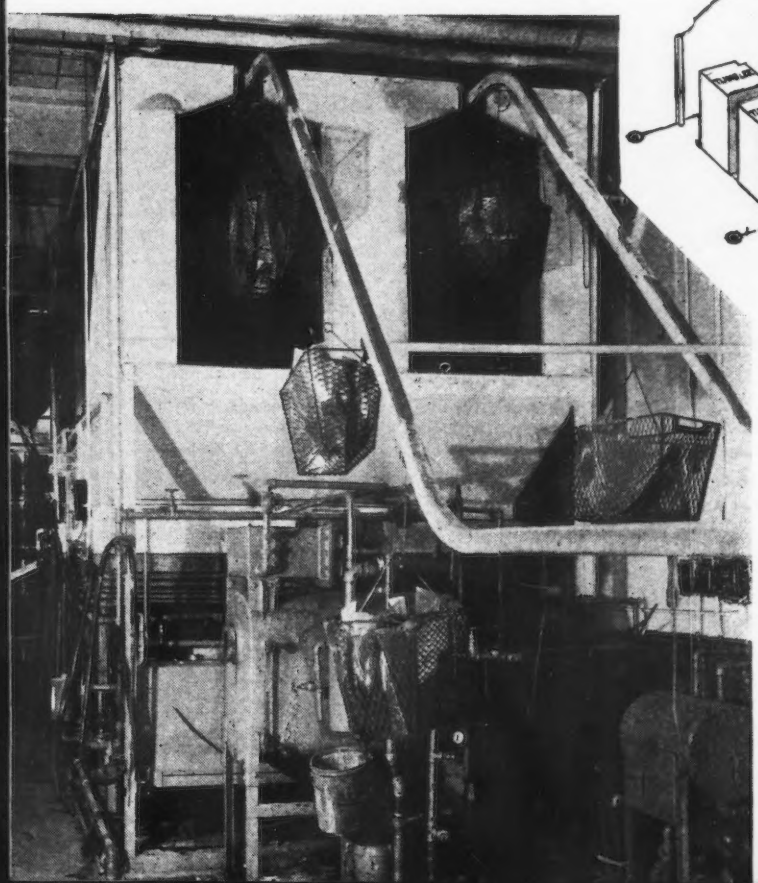


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FIG. 2—Conveyorized degreaser showing baskets of parts entering and leaving cleaning chamber. Hooks are 24 in. apart and travel 18 ft. per min.

Aircraft Parts

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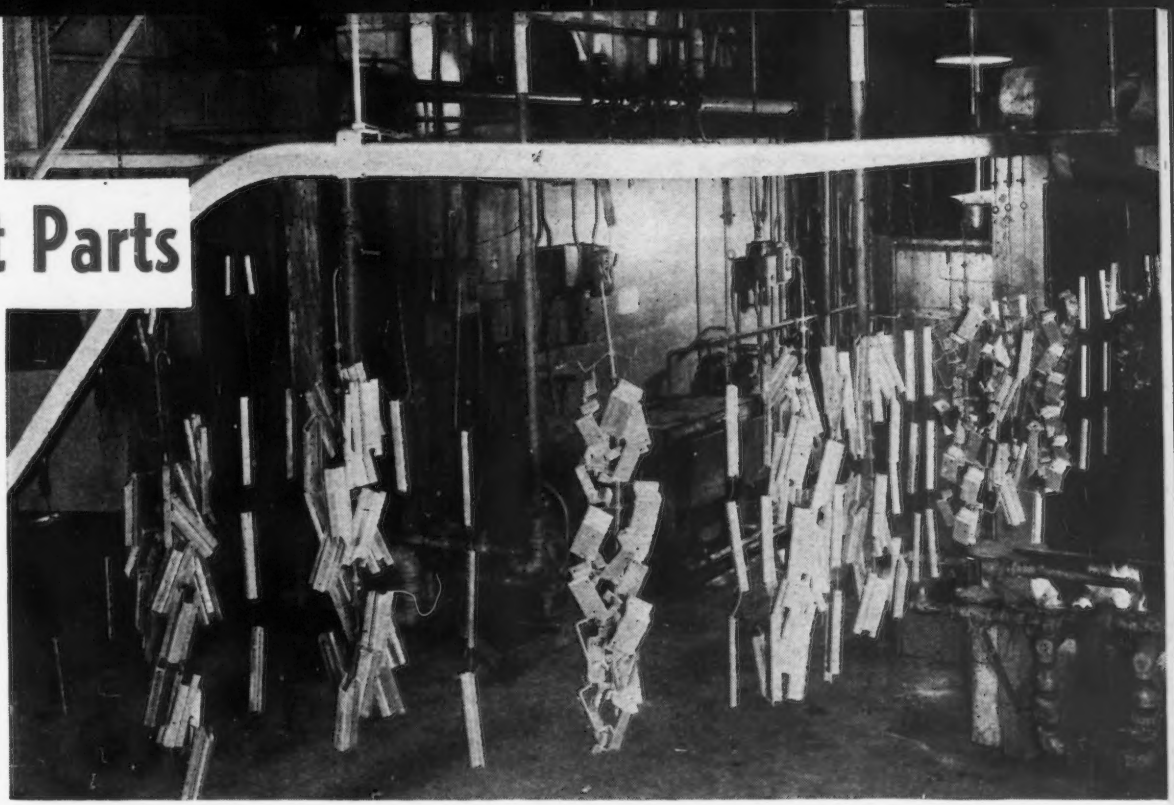

FIG. 3—View of conveyorized washing machine showing typical parts in the foreground as they leave the drying chamber. Hooks are 6 in. apart. Conveyor travels 8 ft. per min.

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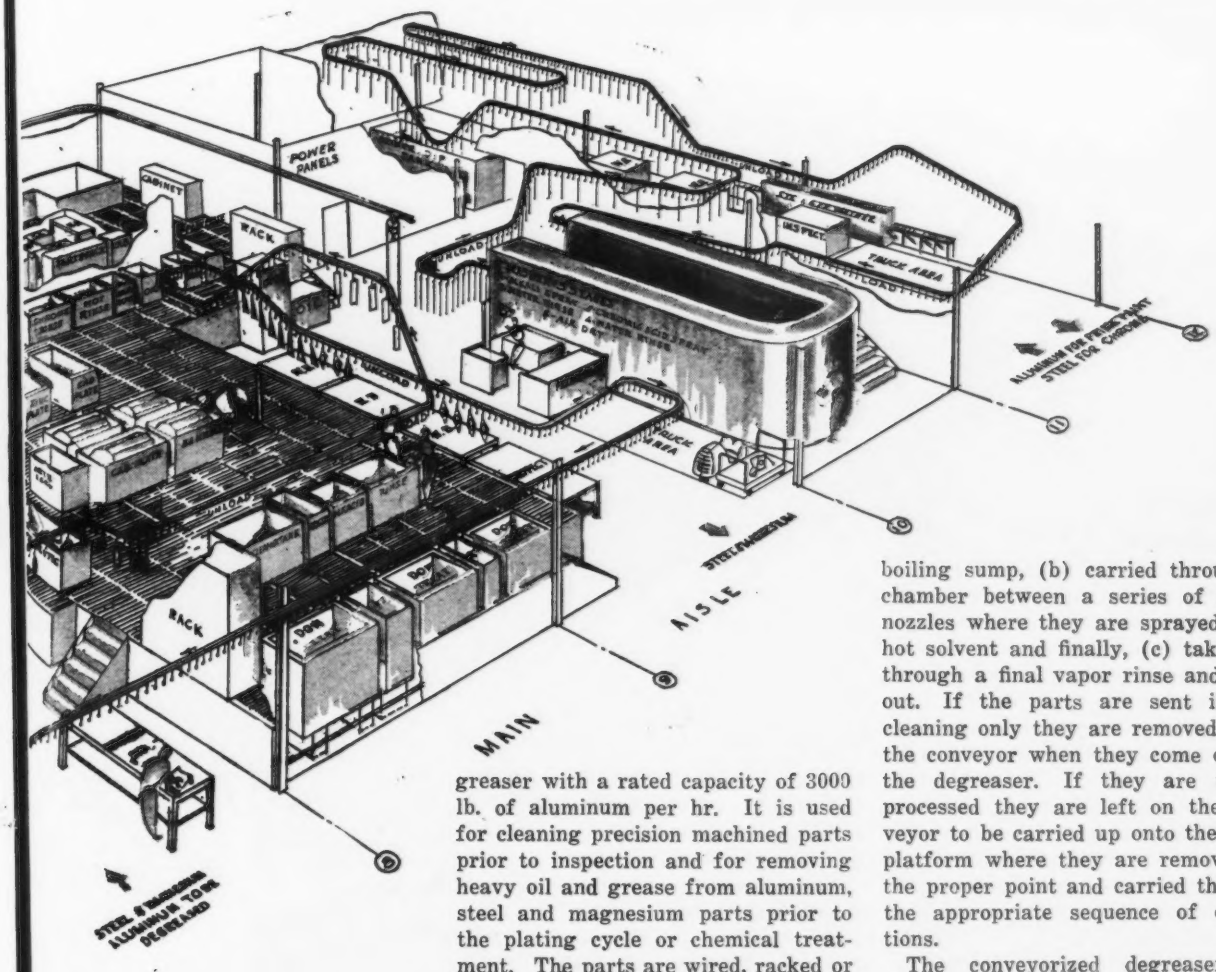


greaser with a rated capacity of 3000 lb. of aluminum per hr. It is used for cleaning precision machined parts prior to inspection and for removing heavy oil and grease from aluminum, steel and magnesium parts prior to the plating cycle or chemical treatment. The parts are wired, racked or placed in baskets and suspended from the overhead conveyor (see Fig. 2). When they enter the degreaser they are (a) lowered down through a trichlorethylene vapor phase above a boiling sump, (b) carried through a chamber between a series of spray nozzles where they are sprayed with hot solvent and finally, (c) taken up through a final vapor rinse and then out. If the parts are sent in for cleaning only they are removed from the conveyor when they come out of the degreaser. If they are to be processed they are left on the conveyor to be carried up onto the work platform where they are removed at the proper point and carried through the appropriate sequence of operations.

The conveyorized degreaser replaced two small, open top, dip type degreasers which had been using approximately 650 gal. of chlorinated solvent per month. Though the new degreaser was immediately burdened

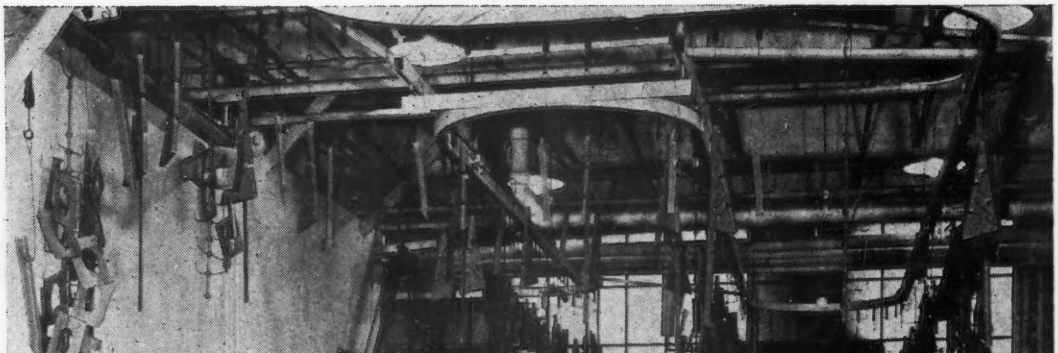


FIG. 4—Dip primed parts circulating in drying area. The firewall at the left around the primer dip tank is the second of two firewalls separating the tank from the gas fired spray washer.

with two to three times the productive load capable of being carried by the two dip degreasers solvent consumption dropped to less than 600 gal. per month.

Spray Chromatizer

The chromatizing machine selected was the Blakeslee gas fired, four tank, spray washer shown in Fig. 3. Parts attached to the conveyor running through this washer are automatically cleaned, passivated, dried, painted, dried and returned in 45 min. to the trucking area for transmittal to the proper assembly department after inspection. This washing machine replaced the conventional series of four dip tanks and a drying oven used for chromatizing aluminum parts and the same general cycle of operations is followed. However, the solution concentrations and process times have been appreciably reduced as shown in the table.

Actually it has been found that 15 sec. each in the alkaline cleaner and subsequent rinse spray is sufficient to remove ordinary soil, the lard oil and kerosene used on the routers, and the soluble oil mixtures used in the machine shop. This is due to the vigorous mechanical cleaning action of the sprays. Heavier materials such as the oil used for heavy forming on the drop hammers and the compounds used for deep drawing operations are removed by vapor degreasing before the parts are sent through the washing machine.

With regard to the operation of the unit, the parts are attached individually or by batches hung on racks to hooks connected to a continuously moving overhead conveyor which carries them into the washer. Tanks at the bottom of the spray chambers of 500 gal. capacity contain the processing solutions. Centrifugal pumps deliver the solutions under a 45 ft. (maximum) head to the spray nozzles set in such a manner that the parts are thoroughly sprayed from both sides, the bottom and diagonally down from above.

Drain areas between the sprays permit the solutions to drain back

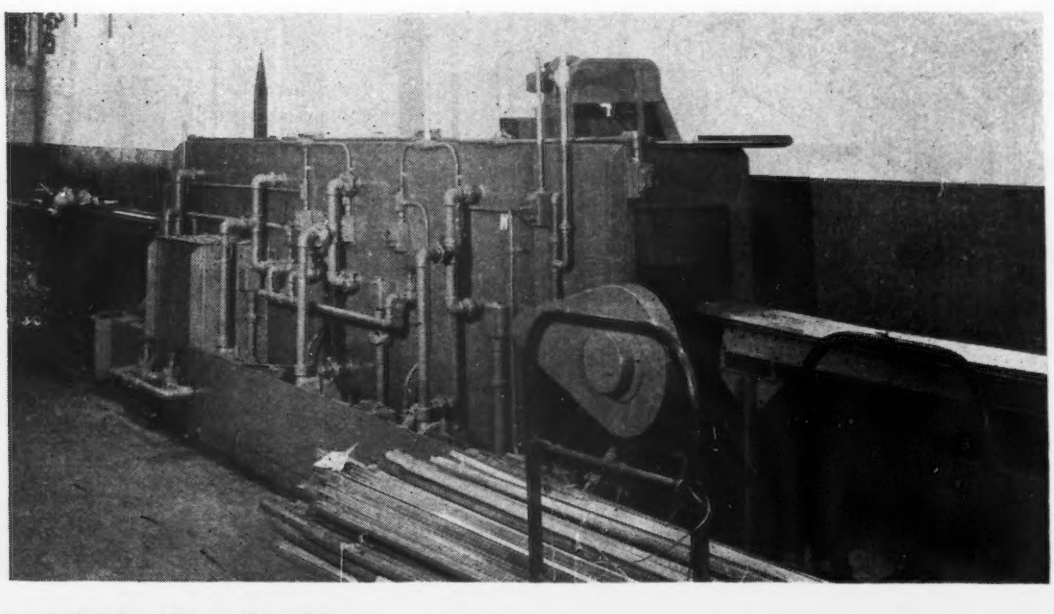


FIG. 5 — Stringer cleaning machine and trucks with typical parts to be cleaned and passivated.

into the reservoir tanks. Before the solutions are recycled they pass through double wire screens and sediment chambers to remove chips or other materials that might plug the spray nozzles. The external sediment chamber tanks are equipped with adjustable, constant level, float type, control valves and skimmer type overflow troughs. Periodic additions of chemicals are made as indicated by the results of laboratory control analyses.

Compressed air blows off the excess rinse water from the parts as they enter the gas heated drying chamber. A dip in the conveyor line outside the oven permits aluminum parts which are too long to go through the present primer dip tank to be removed after they have partly cooled. Anodized parts, small spotwelded assemblies, and magnesium parts to be dip primed may also be attached to the conveyor line at this point. Parts left on the conveyor line are carried through a double firewall, in and out of a primer dip tank, then around in a drying area (see Fig. 4). The parts are allowed to dry for 17 min. before they are handled.

The primer tank is conventional in many respects though some changes have been made. Two rotary agitators, driven by 2 hp. motors were installed to keep the primer mixed. Solvent losses, which at first were extraordinarily high due to heating resulting from constant agitation have been cut by (1) installing a refrigerating unit which maintains the temperature of the mixture just a little above the maximum dewpoint of the room and (2) by using a less volatile and somewhat slower drying thinner instead of the standard AN-T-8 toluene substitute thinner.

Comparison of Immersion and Spray Chromatizing Cycles

Operation and Solution	Concentration and Temperature		Immersion Time Min.	Spray Time Sec.
	Dip Tank	Spray		
Mild Alkaline Cleaner....	4-6 oz./gal. 160-170° F.	¼-½ oz./gal. 150-170° F.	6-8	30
Hot Water Rinse.....	160-170° F.	150-170° F.	1	30
Chromic Acid Passivate..	6-8 oz./gal. 120-140° F.	4-6 oz./gal. 140-160° F.	1-2	45
Hot Water Rinse.....	160-170° F.	150-170° F.	1	30
Hot Air Dry.....	.....	275-300° F.	As required	180

Due to space limitations the chromatizing machine had to be built in the shape of a U and fitted into an area approximately 20 x 30 ft. instead of being laid out in a straight line. For this reason it was necessary to purchase the third item of equipment —the stringer cleaning machine—to clean and chromatize stringers, longerons, spars, etc., which were too long to go around the corners in the U-shaped spray chromatizer. The stringer cleaner is quite similar in principle to the larger spray washer described above, except a belt conveyor is used. It is steam heated, and there is no drying chamber. The long rolled or extruded parts are placed on the belt which carries them through the spray chambers. When they come out they are removed, stacked on end until dry, then spray painted.

Conveyorized equipment for cleaning and finishing detail parts has proved very successful in this plant—so successful that another larger conveyorized washing machine has been ordered. Also, manually controlled overhead conveyors are to be installed for straight line processing of magnesium parts to be dichromate treated and bare (not clad) aluminum parts which must be anodized. Although conveyorized plating installations at the North American Dallas and Kansas City plants have functioned very satisfactorily, the nature of production at Inglewood is such that use of automatic or semi-automatic equipment for plating steel parts can not be economically justified at present.

Ampco Announces Continuous Cast Bronzes

THE sale of continuous cast bronzes, as applied to forms to be machined or used as-cast, has been announced by Ampco Metal, Inc., Milwaukee.

As the name of the process implies, the rod is produced by the continuous withdrawal of metal from the bottom of a casting crucible. The metal is solidified as it leaves the crucible and passes through a suitable cooled die of closely held dimensions. It is guided by driving rolls to a traveling cut-off device which engages at proper intervals to yield sound rods of good surface, uniform diameter and even length. Dirt and drosses, being light, do not enter the solidifying rod according to the company — gases, always present, are eliminated upwards — and the molten bath presents a steady hydrostatic head to prevent the formation of shrinkage cavities.

As proof of inherent soundness to a degree hitherto not consistent commercially, the density of the material so produced is for practical purposes equal to the theoretical density.

Metallographically, the structure is extremely uniform—lead or other secondary constituents being uniformly dispersed in a finely divided state across the entire section. This is readily seen in photomicrographs.

At the present time the following bronzes are available as continuous cast rod that meets the chemical and physical properties of the specification indicated.

AMS 4845B SAE 62—Ampcoloy 742 tin bronze.

WA 6824B—Ampcoloy 342, high lead bronze.

SAE 660 — Ampcoloy 382, bearing bronze.

According to Ampco, the benefits to be expected from the use of this material include:

(a) Improved quality of all production. The practically complete elimination of scrap because of metal faults.

(b) Faster production—adaptable to semi or fully automatic rather than hand chucking machines.

(c) Smaller volume of material to purchase, receive and handle.

(d) Less scrap accumulation, cleaner shop, more space.

(e) Manpower savings—for all reasons above.

(f) Better tool life—no sand in surface, no segregations internally.

(g) Lower power production costs—in many cases drastic.

Cost of Welded

By W. J. CONLEY
Consulting Engineer
Lincoln Electric Co., Cleveland

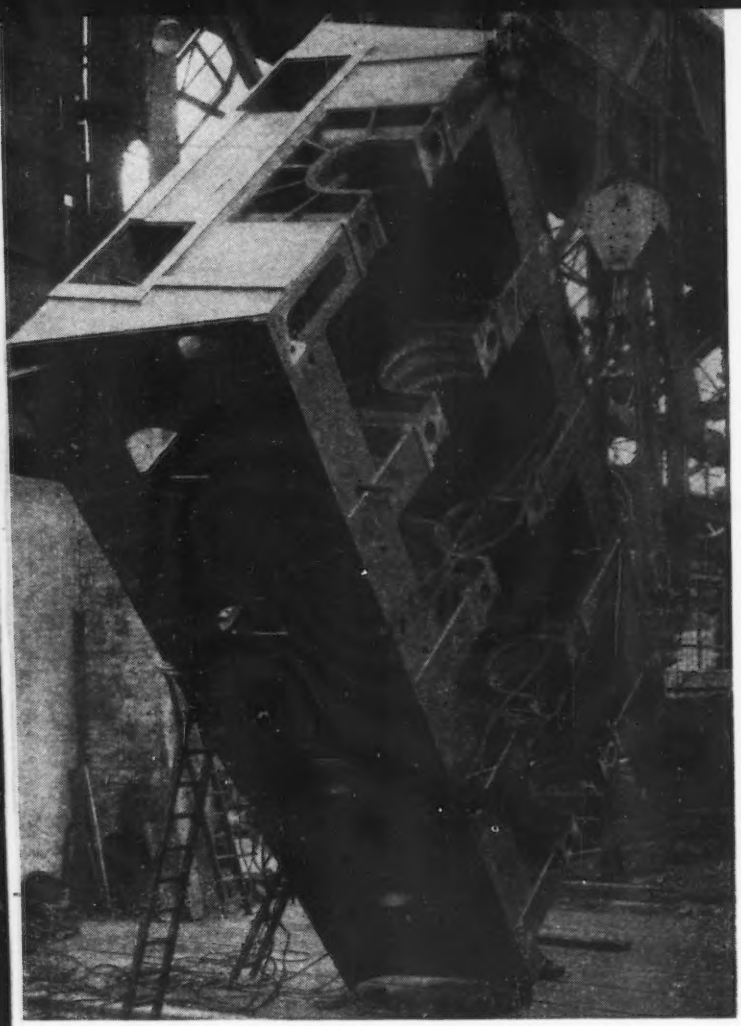


FIG. 1—Arc welded steel bedplate of new diesel engine which has double the power yet is no larger than the cast iron unit it replaces in a motorship.

THE recent article by L. F. Williams of the Cooper Bessemer Corp. on the comparison of costs of construction using castings and weldments leaves such an unfavorable impression as to welding that the author feels that the experience of others with the same or similar designs should be presented. It was stated in this article that, "the best cost on finish machined weldments proved to be nearly twice casting costs." However, a careful analysis of the engineering principles involved in the production of the items under discussion revealed marked discrepancies which disprove the claims made.

In order not to seem prejudiced, it was decided to make a survey among leading producers of heavy machinery of the type discussed in the above-mentioned article. The results showed such an overwhelming repudiation of the cost comparisons in the Williams' article that some engineering authorities were surprised to learn that such an apparent lack of open-mindedness in redesign for welding existed in these days of progressive fabricating techniques. The simplicity of joining by means of arc welding must be kept continually in mind. When this is done the designing and breakdown for fabricating can be planned so that a minimum of welding and handling will be necessary.

From the conclusions presented in the article in question, one logical assumption is that full advantage of the freedom of design in welded construction was not taken although this tremendous advantage is one of the inherent characteristics of the welding process.

While the author admits that "progress in welding technology and design has been so 'effective' that no machinery builder can afford to neglect what is going on in that field," he apparently attempts to convey an impression that design for welding is difficult. Whether this stems from a lack of understanding of the relative simplicity of welded design or whether it is due to his long association with his company's large foundries that require a large volume of casting work to assure profitable operation, is largely left to the reader's imagination.

But let us look at the comparisons presented in the article and weigh them with the conclusions reached by prominent engineering authorities.

In the first place, Mr. Williams implies that heavy machinery parts, at least those discussed in his article, are designed for use only on the basis of cost in limited production. Engineering significance reaches much deeper than this, even though the diesel engine items used as examples by the author were of a design that could apparently be substituted, one for the other, regardless of whether they were of cast or welded construction. If such was the case, those responsible obviously did not use the proper designing approach.

The proper designing approach to welded construction does not involve an attempt to duplicate the former cast design. Full advantage of the inherent freedom of the welding process is utilized by fabricating the item from steel plate, bars, angles, channels and other structural shapes. The redesign may call for various combinations of metals and alloys and possibly include pressed steel parts or steel castings to meet individual stress and service specifications.

Even though Mr. Williams claims that his casting comparisons were obtained from "outside firms who had won a reputation for ingenuity in design and efficiency in the production of welded structures," as well as his own company, his statement that the "weldments proved to be nearly twice casting costs" appears ridiculous in the light of results obtained from the survey just completed.

The Cooper-Bessemer data for the engine block for a 1000-hp. diesel is repeated here for comparison with those to follow:

	Cast (Meehanite)	Welded
Finished weight, lb.	10,620	11,442
Production rate per month..	4	20
Finished cost, each	$1,774	$6,875

Now analyzing this weldment on a basis of the experience of those consulted in the survey and making estimates according to the best welding

Structures Compared With Iron Castings

. . . A rebuttal to the article, "Cost of Meehanite Castings vs. Welded Structures," by L. F. Williams, Cooper-Bessemer Corp., which appeared in the May 18, 1944, issue of THE IRON AGE. In order to disprove the statement that certain finish machined weldments cost twice as much as finished castings, Mr. Conley summarizes the results of an informal survey of welding fabricators made by his company both here and abroad.

practice, the following is obtained on very similar types of machines and components of them:

	Cast	Welded
Finished weight per piece, lb.	10,620	8,000
Material cost per piece	$1,062	$320
Direct labor (man-hours per piece)		
Foundry or weldery	100	200
Machining	170	200
Total	270	400
Pattern cost per piece (including design and production)	$350	
Total production time per piece and machining	$540	$800
Total cost per piece including all operations and materials	$1,952	$1,120

To make a fair comparison the cost of the pattern should be deducted, making the cast block equal to $1,602 against $1,120 for the welded structure.

Not only was there a discrepancy of $5755 in comparative welding costs, but an additional weight saving of 3442 lb. was indicated through proper application of welded redesign. This makes it hard to understand how the values quoted could be as much or six times higher per item than these conservative figures.

One of the prominent manufacturers of similar types of heavy machinery submitted the following analysis which is typical of those reported by the survey:

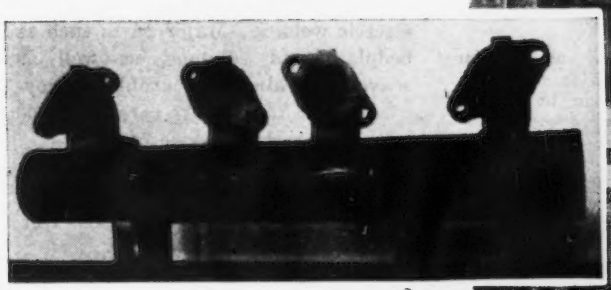
"A detailed study of the article, 'Meehanite Castings vs. Welded Structures,' was made and the cost comparisons were analyzed. There seems to be some inconsistencies in the cost of meehanite castings completely machined.

"So far as the cost of welded construction is concerned, we compared the parts to similar parts of approximately the same weight of our own products, and have the following cost comparison. These parts are just about as complicated to weld and are also manufactured in small quantities.

"The following costs are comprised of material cost, hours, labor, and overhead, and do not include any machining of the finished welded struc-

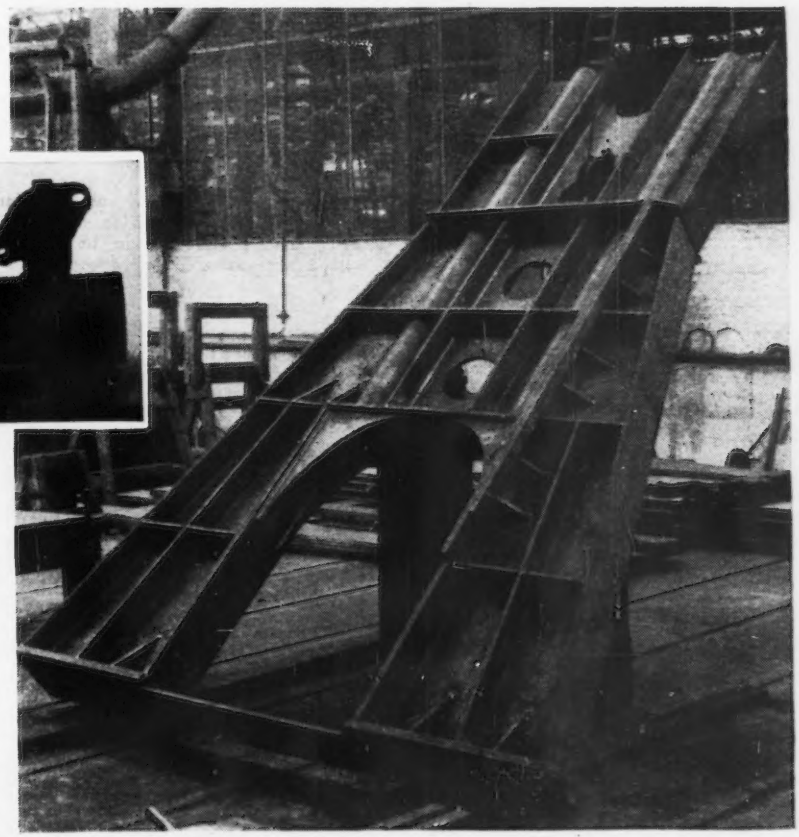
Cost of Welding Diesel Engine Components

	Weight, lb.	Welding Hours	Welding Cost	Cost/lb.
Diesel engine revolving frame	14,115	252.3	$1,082.37	$0.077
Manifold separator	188	6.4	20.57	0.109
Drive housing trolley gear case	566	16.5	58.76	0.104
Gear housing gear case	530	16.3	58.16	0.11
House gear case cover	547	11.0	46.10	0.085



ABOVE

FIG. 3—Weld designed manifold which resulted in 47 per cent cost reduction due to simplifications.



RIGHT

FIG. 2—One of the main columns, built entirely of arc welded steel for 4000 hp. diesel engine recently completed in England.

tures. The machining was omitted because of difficulty in ascertaining the amount of machining on the pieces discussed in the article."

Note that the cost per pound of parts for welded fabrication of the above group of comparable items averages only $0.097, while the price per pound of the machined welded parts listed in the article under discussion runs at high as $2.63, an unheard of figure until its appearance in the article. [For the engine block and base, the total *machined* cost is $0.60 per lb. Ed.]

Further evidence of the fallacy of the claims made by the author of the article is his reference to "ruinously expensive failures" of certain types of steel engine frames of welded design. He bases his statement on information from an individual in British naval affairs who is said to have found that steel weldments under severe battle conditions, are sometimes thrown out of line so that they cannot be salvaged. This is evidently an attempt to subordinate the greater known strength of rolled steel over cast iron as shown in the accompanying table of relative comparisons.

It may be argued that cast iron qualities may be improved, that the unit stresses may be changed; that other casting materials may be used. If this is done, the cost per pound is increased and the increased saving due to the weight reduction is largely offset.

Mechanical Properties Compared

For special cast iron the American Society for Metals Handbook gives the tensile stress as 35,000-50,000 lb. per sq. in. and the compressive strength as 135,000-175,000 lb. per sq. in. The American Society for Testing Materials classifies cast iron in groups with values for tensile strength from 20,000 to 60,000 lb. per sq. in. The higher strength irons are premium materials as in the case of Meehanite. Brady's Materials Handbook gives values for this latter material as 35,000-55,000 lb. per sq. in. for tensile strength and 135,000-175,000 lb. per sq. in. for compression.

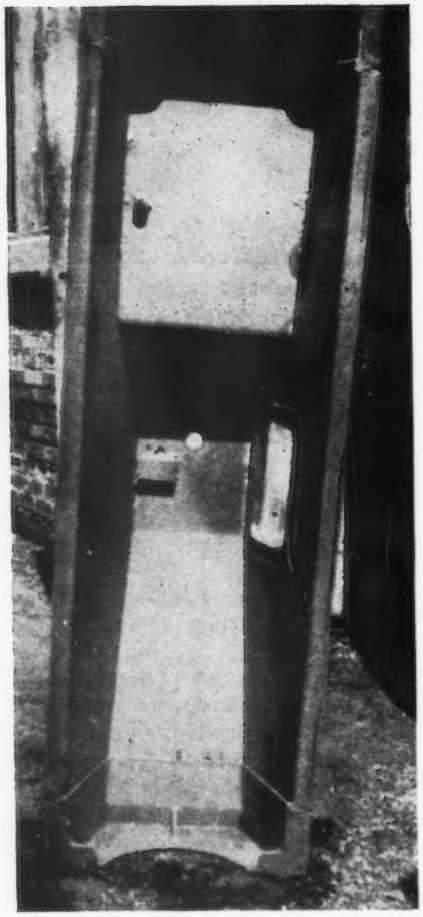


FIG. 4—Ease of assembly and welding produced 45 per cent cost saving in production of this engine oil pan.

Bulletin No. 19 of the Meehanite Research Institute of America, Inc., gives values for type GA Meehanite as follows: tensile strength 56,300 lb. per sq. in., yield point 47,200 lb. per sq. in., proportional limit 21,600 lb. per sq. in., and modulus of elasticity of 21,000,000 lb. per sq. in. On a comparison with structural steel these values would indicate relatively high design stresses but it must be remembered that Meehanite is still cast iron, so that higher factors of safety must be used as shown in the table giving average values for cast iron.

The statement concerning "ruinously expensive failures" was made despite the fact that there are thousands of welded diesel frames in satisfactory service, many of which have withstood repeated "severe battle conditions." It is a matter of record that these structures survived such conditions much better because of their welded construction.

Some of the responses to the Lincoln survey included "heavy" machinery manufacturers such as a diesel engine builder who reported construction of a welded diesel engine replacement which doubled the power of the vessel into which it was installed, yet required no more space than the original unit. The report said in part, "Construction of an engine having a high ratio of power to size has been made possible by improved design employing steel and electric welding. Major parts such as bedplate and columns, as well as scavenging air main, crankcase cov-

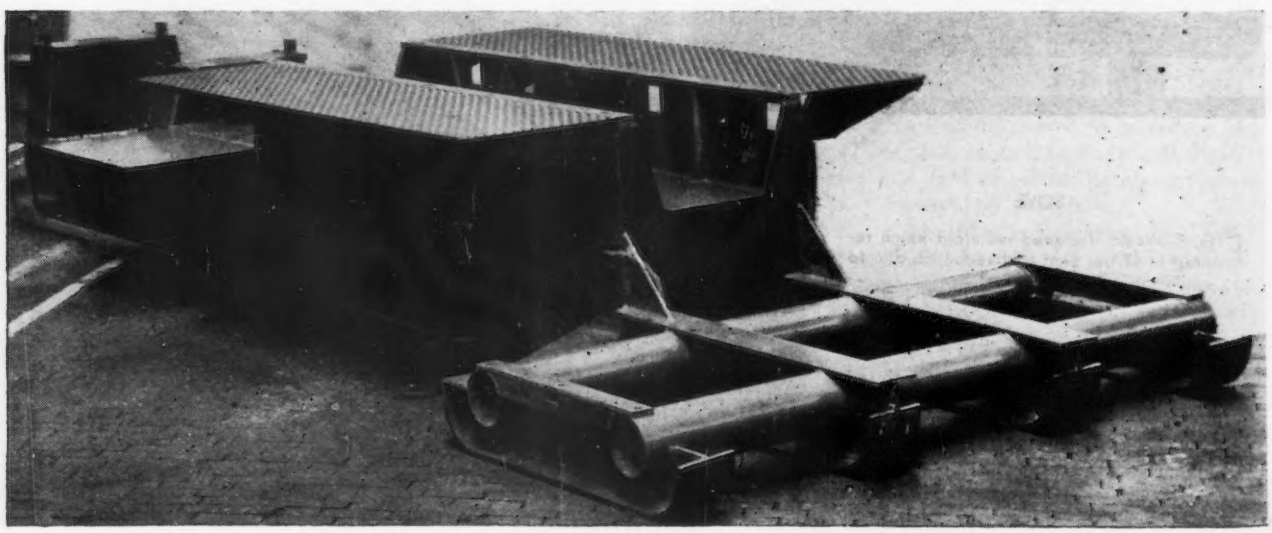


FIG. 5—Special welded sub-base for diesel engine designed so that ordinarily unused space could be utilized without increasing overall dimensions of structure.

ers and plates and exhaust pipe, are all built of arc welded steel plate. The use of arc welded steel provided maximum strength and rigidity per minimum size of members and minimum pound of weight. This advantage enabled us to obtain a structure double the capacity possible with a suitable form of cast iron construction."

Views of this redesigned diesel engine are shown in Figs. 1 and 2.

Other welded engine parts similar to those discussed in the Williams article are illustrated in additional accompanying photos. Fig. 3 shows a manifold consisting of one inner casing 3½ in. diameter and 38 in. long; one outer casing 4½ in. diameter and 39 in. long; two cast steel flanges, threaded inside for 3 in. pipe; four pieces of fabricated square tubing; four cast steel elbows milled and drilled to fit exhaust port cylinder studs; and two cast steel bases for water inlet and outlet ports. Study of production procedure disclosed means of simplification which permitted a 47 per cent reduction in cost, that is, from $20.75 to $11.

Fig. 4 illustrates an oil pan redesigned for welding which resulted in a cost saving of 45 per cent due to speed and efficiency of assembly.

Another typical example of the freedom of welded design is shown in the all welded diesel subbase, (Fig. 5) which was arc welded in three sections weighing a total of 6330 lb.

Accepted Design Factors for Rolled Steel and Cast Iron

	Material	Compression	Tension
Ultimate Values In lb. per sq. in.	Cast iron	100,000	30,000
	Rolled steel	60,000	60,000

	Material	Load		
		Steady	Varying	Shock
Safety Factors	Cast iron	6	10	20
	Rolled steel	4	6	12

	Material	Load		
		Steady	Varying	Shock
Working Values of Compression In lb. per sq. in.	Cast iron	15,000	9,000	4,500
	Rolled steel	20,000	15,000	7,500

	Material	Load		
		Steady	Varying	Shock
Working Values of Tension In lb. per sq. in.	Cast iron	3,750–5,000	2,000	1,500
	Rolled steel	20,000	15,000	7,500

Although many other types of "heavy" machinery parts were covered in the survey, space does not permit a review of the entire field. Thousands of heavy machine structures, however, are being turned out constantly and every indication shows that more and more are being redesigned for welding. Thus, manufacturers are continually showing a fast growing preference for industrial designs of the type made possible by welding which possess qualities such as speedier fabrication, safety and utility and economy which surpass the traditional designs they replace.

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WHAT is believed to be the largest mechanical, two housing press brake in the world was recently built for the American Rolling Mill Co., Middletown, Ohio, by the Cincinnati Shaper Co. Capable of exerting a pressure of 1000 tons, the machine will bend cold a plate 20 ft. long by ¾ in. thick as shown in the illustration. The machine has a clear distance of 20½ ft. between housings and an overall die surface of 30 ft. In their making, each of the four main members required the full capacity of Luken Steel Co.'s 200 in. plate mill, the largest in the world. Housings are made of 8 in. plate and the ram and bed of 7 in. plate. To obtain the 30 ft. length of the latter, wing extensions were arc welded to each end of the main plates. A 50-hp. motor drives the brake, which weighs approximately 250,000 lb.

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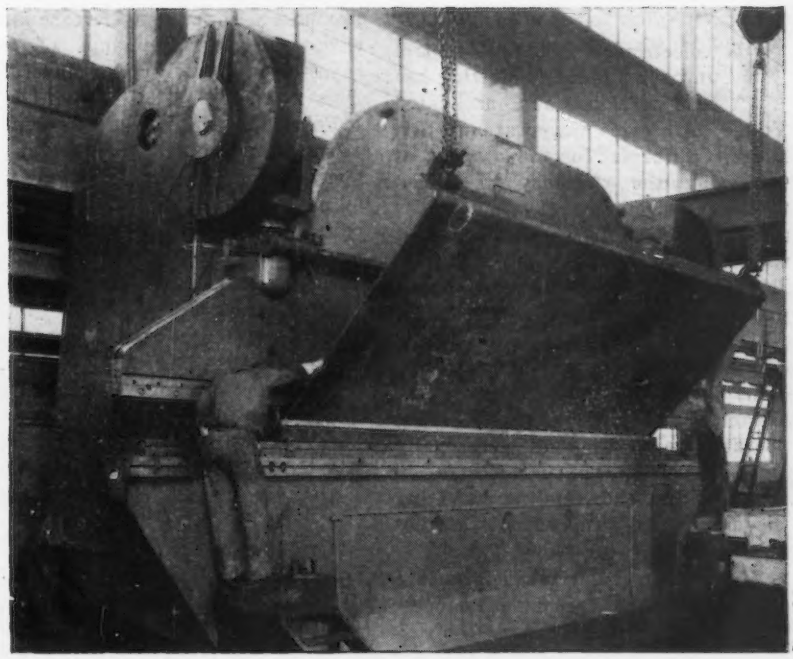
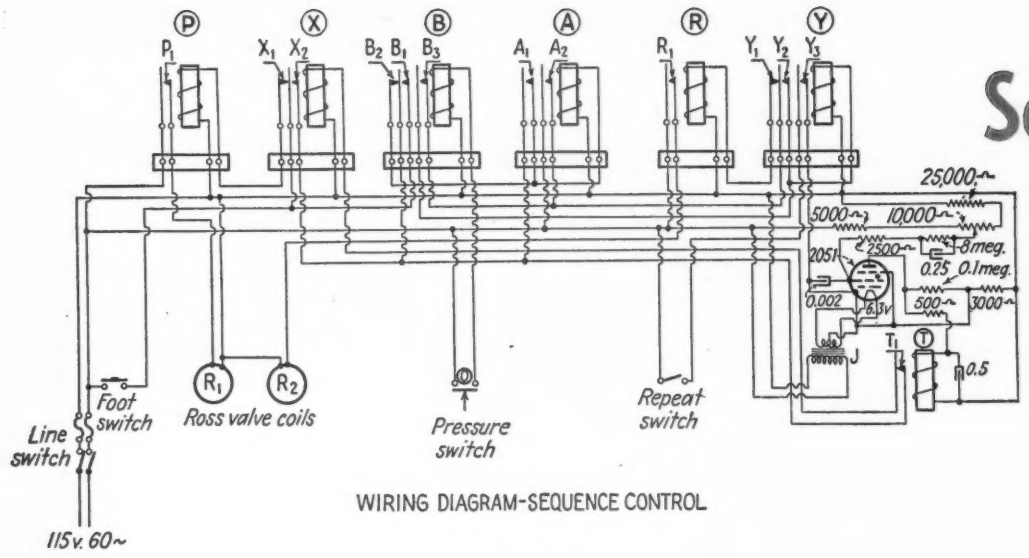
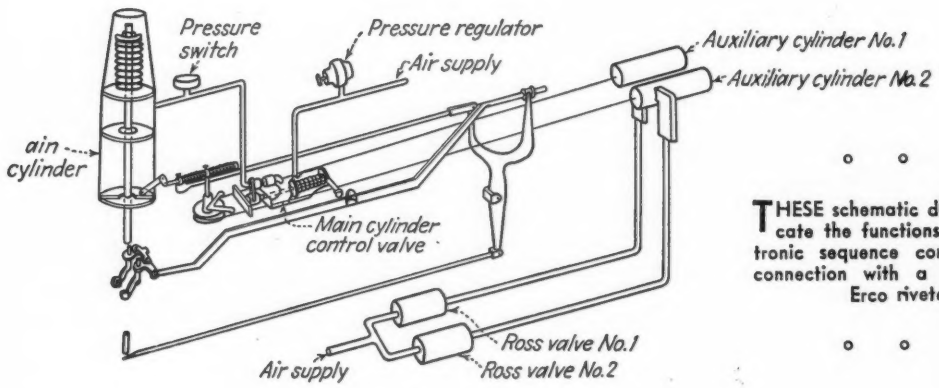


Sequence



WIRING DIAGRAM-SEQUENCE CONTROL



SCHEMATIC DIAGRAM

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THESE schematic diagrams indicate the functions of the electronic sequence control unit in connection with a Model 2002 Erco riveter.

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AN electronic sequence control unit for automatic riveting has been developed at Consolidated Vultee Aircraft Corporation, San Diego, California, for the purpose of increasing the efficiency of Model 2002 Erco riveters.

Before this unit was developed, it was necessary for Model 2002 machine operators to control complicated flush riveting processes by means of foot pedals; and, because the speed and accuracy of the individual machine depended entirely upon the alertness and good judgment of the operator, mistakes were occasionally made—causing excessive losses in time and materials, and necessitating the premature replacement of machine parts.

With the new electronic sequence control unit, the Erco machine operator is required to depress only a single lever; thereafter, the entire punching and riveting sequence is accomplished without human assistance. Time studies have revealed that this produces a 20 per cent increase in efficiency and parts savings of more than 35 per cent for the Model 2002 Erco machines.

Physically, the new unit resembles a small radio set. It governs the operations of an Erco riveter simply by actuating a series of electrical circuits in a suitable sequence. The electrical circuits in turn actuate the various parts of the machine in the required order.

With reference to the accompanying schematic diagram, events take place in the control unit and riveter as follows:

(1) The foot switch is closed by the operator and relay P is energized, closing contacts P-1.

(2) Closing contacts P-1 energizes the solenoid, opening Ross Valve No. 1.

(3) Air entering auxiliary cylinder No. 1 actuates the shift mechanism — moving the die button into the punching position, locking the punch, shifting the piston stop block under the main piston, and opening the main cylinder control valve.

(4) Air entering the main cylinder drives the plunger down into the die bottom, whence it continues to descend — contacting the material and forcing the die over the punch until it is halted by the piston stop block.

(5) When air pressure in the main cylinder increases sufficiently, pressure switch 0 closes.

(6) Closing pressure switch 0 energizes relay B, closing contacts B-1 and B-3.

(7) Closing contacts B-1 energizes relay X.

(8) Energizing relay X opens contacts X-1.

(9) Opening contacts X-1 de-energizes relay P.

Control for Automatic Riveting

By Walter Mandel
Electrical Engineer, Consolidated Vultee Aircraft Corp.

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(10) Opening contacts P-1 de-energizes the solenoid or Ross Valve No. 1 and allows air to exhaust from auxiliary cylinder No. 1.

(11) When the air pressure in auxiliary cylinder No. 1 is reduced, the spring in the main cylinder control valve opens the exhaust for the main cylinder; then the main cylinder spring returns the plunger to its normal position.

(12) When air pressure in the main cylinder is reduced, pressure switch 0 opens.

(13) Opening pressure switch 0 de-energizes relay B.

(14) De-energizing relay B closes contacts B-2.

(15) Closing contacts B-2 energizes relay A.

(16) Closing contacts A-2 energizes the solenoid of Ross Valve No. 2.

(17) Air entering auxiliary cylinder No. 2 actuates the shift mechanism—moving the rivet shoe into alignment with the rivet set, removing the main piston stop block and punch lock, and opening the main cylinder control valve.

(18) Air entering the main cylinder moves the piston down, causing the rivet set to enter the rivet shoe and guiding the rivet shoe and rivet to a position directly above the punch. Continuing to descend, the rivet enters the work and pushes the punch out of the work ahead of it. The punch comes to rest at the top face of the anvil, and at the extreme end of the stroke the rivet head is formed.

(19) When the air pressure in the main cylinder is sufficiently high, pressure switch 0 closes.

(20) Closing pressure switch 0 energizes relay B, closing contacts B-3.

(21) Closing contacts B-3 energizes relay Y, opening contacts Y-1.

(22) Opening contacts Y-1 de-energizes relay R, opening contacts R-1, shown at left.

(23) Opening contacts R-1 de-energizes the solenoid in Ross Valve No. 2, allowing air to exhaust from auxiliary cylinder No. 2.

(24) When the air pressure in auxiliary cylinder No. 2 is reduced, the spring in the main cylinder returns the plunger to its normal position.
(NOTE: If the foot switch remains closed and the repeat switch remains open, the cycle of operation is complete and the machine becomes inoperative.) If the foot switch is open relays X, A and Y return to their normal positions. If the foot switch remains closed and the repeat switch is closed at or before the end of operation No. 24, the following events occur:

(25) The energizing of relay Y closes contacts Y-2 and Y-3, and causes the timing circuit to become inoperative.

(26) When the plate current of the thermionic tube reaches a value sufficiently high to operate relay T, contacts T-1 opens.

(27) Opening contacts T-1 de-energizes relay X.

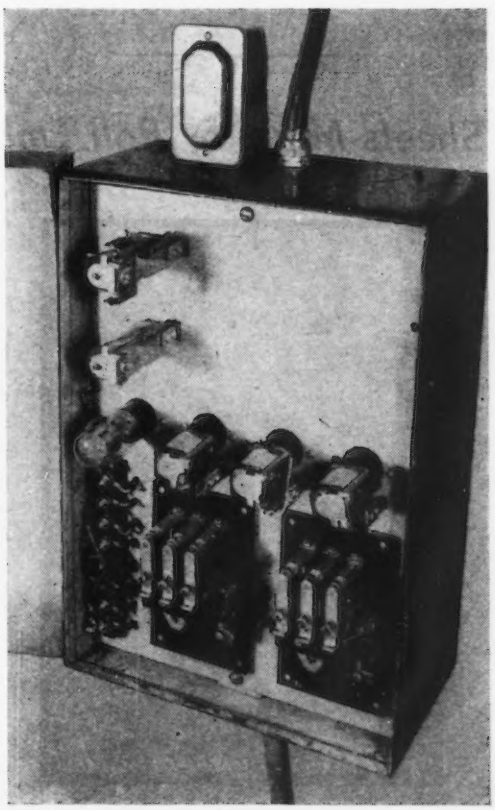
(28) Opening contacts X-2 de-energizes relay A.
(NOTE: Contacts X-1 closes in accordance with the explanation given for operation No. 31.)

(29) Opening contacts A-2 de-energizes relay Y.

(30) Opening contacts Y-2 connects the timer circuit.

(31) Returning to operation No. 28: Closing contacts X-1 energizes relay P, thus returning the unit to the condition that existed at the beginning of operation No. 1, when relay P was energized by closing the foot switch.

A CLOSE-UP view of the new electronic sequence control unit.



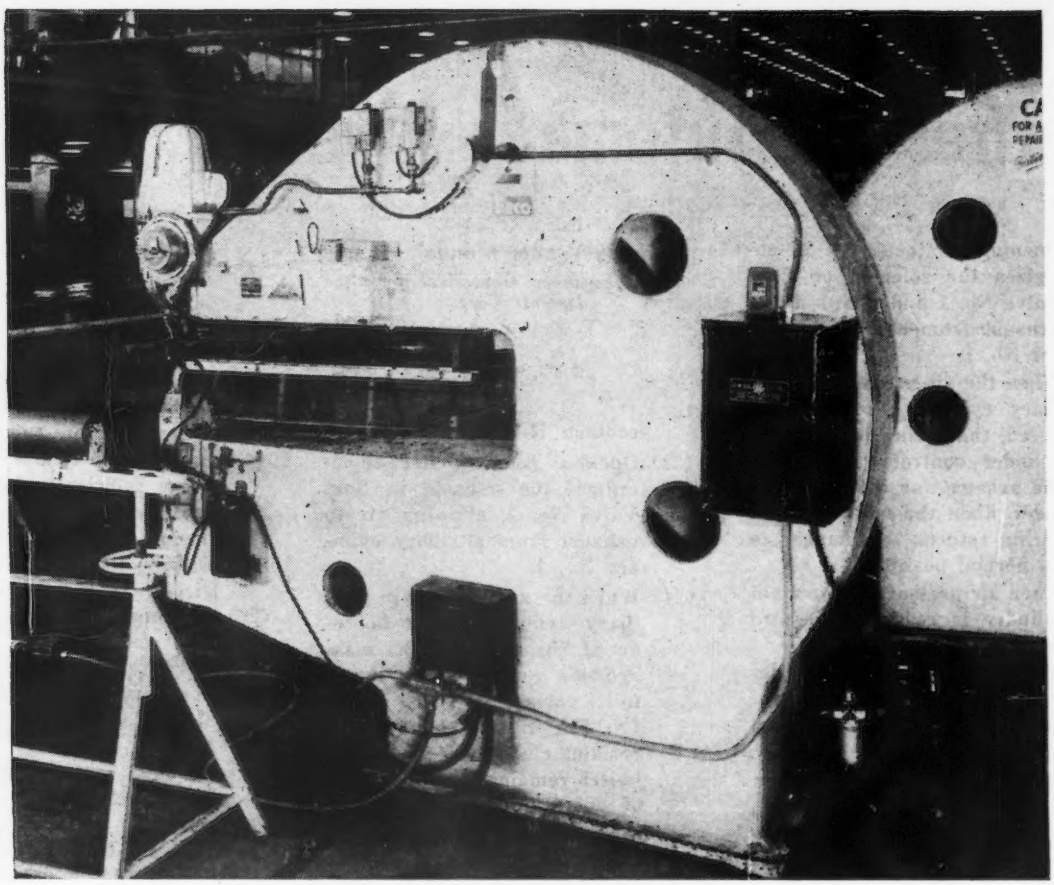
This sequence of operations will be repeated as long as the foot and repeat switches remain closed. The speed of the operations depends upon the setting of the potentiometer which controls the time constant of the timer circuit.

With manual controls, a single Erco 2002 riveter can handle about 10 normal-sized airplane panels in an 8-hr. day. With the new electronic sequence control unit, the same machine will turn out approximately 12½ normal-sized airplane panels in an 8-hr. day.

Savings in Erco parts with the control unit can be determined by an examination of the following table:

Name of Part	Cost, Dollars Each	Manual Control	Electronic Control
Die button ..	3.20	27	9
Punch	1.15	27	9
Control cable	1.50	2	1
Piston stop ..	18.00	2	1
Set links	18.00	2	1
Pair shoes ...	13.75	2	1
Slide rod (safety) ...	3.75	2	1
Ball bolt	3.00	6	1
Shift rod	13.00	2	1

This table was made up from



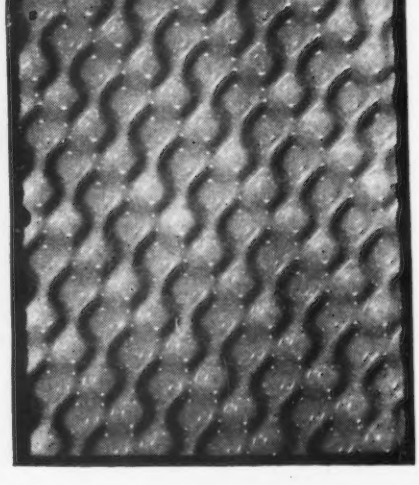
A model 2002 Erco riveter equipped with one of the new electronic sequence control units.

records kept over a period of six months for two Erco riveters—one of which was manually controlled, while the other was electronically controlled. If the given data are totaled, it will be found that the manually-controlled machine parts cost $250.95, while the electronically-controlled machine parts cost only $111.65. This indicates a saving of $139.50 for a single electronic control unit during a period of six months.

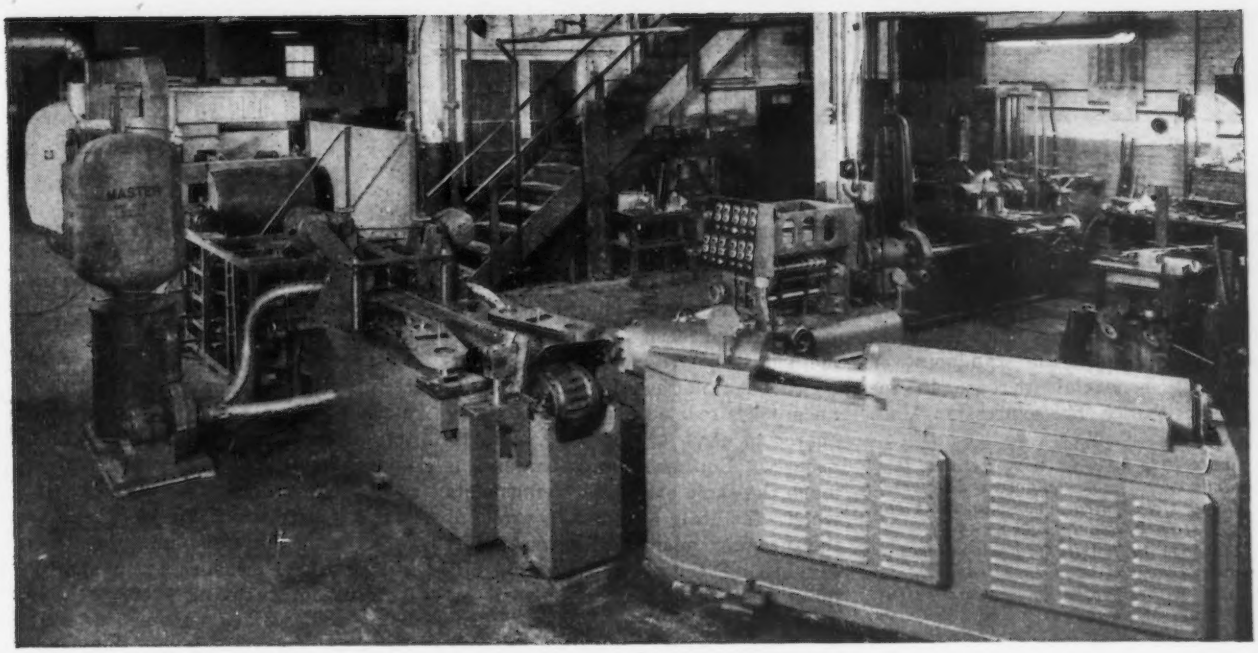
Rigid Sheets Made by Roll Embossing

RIGIDIZING, a new method of cold forming sheet metal, is a patented design-rolling process, the metal being distributed throughout the cross-section to give extra strength and patterned surface effects, and to produce marked changes in the mechanical, textural and utility values. Rigidized Metal is ideal for adaptation to porcelain enamel sheets and panels for store front installations, according to R. S. Smith, president of Rigid-Tex Corp., Buffalo.

Rigidized sheets eliminate the problems of "waves" in the flatness of panels for architectural use. Previously, the only solutions were by panel backing and by firing the panels with a ripply finish, thereby destroying the continuity of highlights.



Rigidized sheets are available in a wide range of designs. However, two definite patterns are particularly attractive and practical for adaptation to porcelain enameling. The coarser pattern is very suitable for use as a sign panel, with either block or cutout letters set away from the panel. The effect may be further enhanced by creating a blending of colors and highlights on the porcelain enameled sign panels, and by the installation of neon tubing in the hollow backing of the block letters to accentuate this blending of colors. The use of Rigidized Metals will not interfere with the normal fabrication methods used for the materials involved.



MOSLO electrode coating unit, showing extrusion press at right and drying oven, left rear. Central control panel can be seen on the feeder just behind the extruder.

Electrode Coating Unit Has Novel Features

SEVERAL features of interest to the welding rod processing industry, including a new principle of extruded flux application employing a die head set at a 60-deg. angle, have been combined in a new processing plant built by the Moslo Machinery Co., Cleveland. The unit is capable of producing 1000 rods per min.

Demonstrated recently by Ernest P. Moslo, designer and head of the company, this new plant offers, among other things, a centralized control panel by which one man can start and stop every operating unit, a compact, seven-pass oven requiring 40 per cent less floor space than similar equipment, and an improved mechanism for transferring electrodes in the oven from one pass to the next, in accurate alinement and without dropping or rolling.

Another part of the equipment demonstrated was a new type slug press, installed with the hydraulic piston partially below floor level, allowing the operator to charge and remove slugs from the press at waist height, reducing operator fatigue and increasing slug production. Also included in the plant is a Simpson mixing machine for blending the various coating minerals and organic materials which are fed into the slug press, as well as a machine which straightens and cuts off the rods to standard length.

Smoother operation of the plant and a greater uniformity of coated rods are the result of the new die head, in which flux is extruded on the wire in the normal direction of rod flow, and not at the 90-deg. angle conventionally used. Under 10,000 lb. pressure, the flux is forced from the hydraulic extrusion press into the die head, thoroughly coating the electrodes as they pass through in a continuous stream from the magazine feeder unit. Extruded rods hit a stop and are immediately deposited on a rubber belt conveyor which carries them past the wire brushes which strip the tip and the grip end. After brushing, the electrodes pass into the oven transfer system and thence on to the inspection table prior to being loaded into shipping cartons.

Unique in plants of this type is the unit control panel with start-stop switches controlling every unit and a single emergency switch over them all. One man, at the operating point, has complete control of the plant at his fingertips, and in addition, there is a newly-patented safety control,

(CONCLUDED ON PAGE 124)

DISCHARGE end of unit, illustrating the roller chains which form the conveying system in the seven-pass dryer seen in the background.

Mechanical and Metallurgical Advantages

BY this time it is apparent that some control must be exercised over shot peening operations if the surface layer of the design members is to be uniformly and adequately cold worked from the standpoint of obtaining beneficial increase in fatigue resistance. The expression "shot blasting" is usually associated with cleaning or descaling operations where control of the operation is anything but critical. The phrase "shot peening" has been designated as the method employed for surface treatment when increased fatigue resistance is desired, although the cleaning operation may be obtained simultaneously. Equipment in both cases is much the same except for refinements which facilitate definite control of the peening operation to meet certain specifications. One essential difference is that peening equipment requires the use of an adequate separator for removing the broken shot as too fine particles are detrimental or do not contribute to increased fatigue resistance.

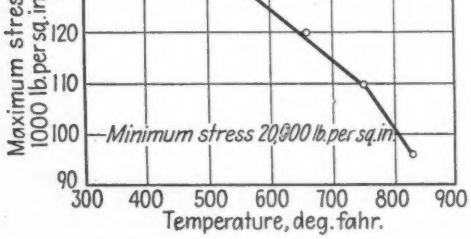
Two principal types of machines are in general use, namely, the air blast and the mechanical blast. A third type, although used now principally for honing, is the liquid blast.

Instrumentation for measuring the degree of shot peening being given the work piece was a problem to which Almen[n] devoted much painstaking development work. A very ingenious and simple means was evolved as shown in Fig. 21 whereby a flat strip[1] of steel is attached to a jig block. This assembly is fastened to the critical area of the part passing under the shot stream so that one side of the strip is peened. The strip is then removed from the block and located on the dial indicator gage shown in Fig. 22 to measure the change in longitudinal curvature[m] of the strip. Being cold worked on one side only, the strip assumes an arc shape and the height of this arc is a measure of the degree of shot peening. It is necessary to know how the arc height obtained from the strip correlates with fatigue resistance. This correlation can only be developed by fatigue tests being made on the actual parts until sufficient background of data may be accumulated.

While this instrumentation in its present form leaves much to be desired, it is the best available. The sensitivity of the test is low in that for large variations in peening conditions the changes in arc height values may only be a few thousandths of an inch and yet large differences in fatigue resistance may result. It should not be inferred that maximum arc height connotes optimum fatigue resistance. Considerable doubt exists

[1] *This strip is ¾ in. wide by 3 in. long and comes in two thicknesses designated as the A strip which is* 0.051 *in. thick and the C strip* 0.0938 *in., Rc* = 44-50.

[m] *Change in longitudinal curvatures is measured over a fixed gage length of* 1.3 *in. and is designated as the arc height. Two types of gages Nos.* 1 *and* 2 *are used although the latter type is preferred because it measures the curvature from the unpeened side of the strip as shown in Fig.* 22. *The No.* 1 *gage measures curvature from the peened side and the surface roughness and transverse curvature interferes with accurate arc height measurements. Arc height readings are designated, for example,* 0.008A2 *which means that the height of arc is* 0.008 *in. on a* 0.51*-in. thick strip using No.* 2 *type of gage.*



LEFT

FIG. 20—Effect of heat on shot-blasted springs. (Zimmerli)

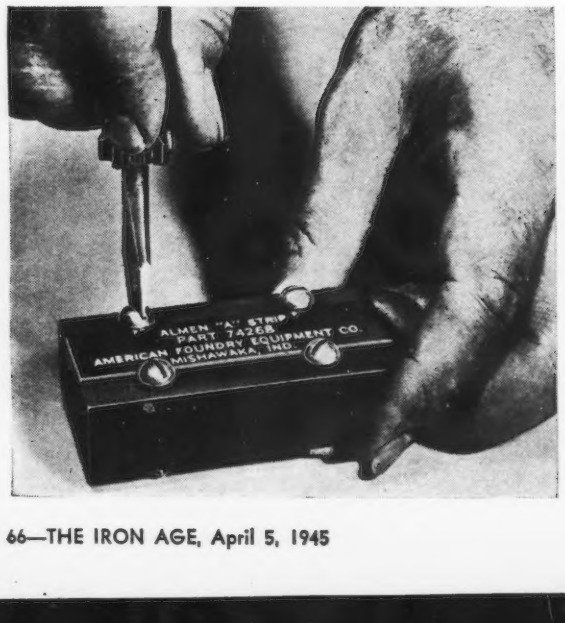


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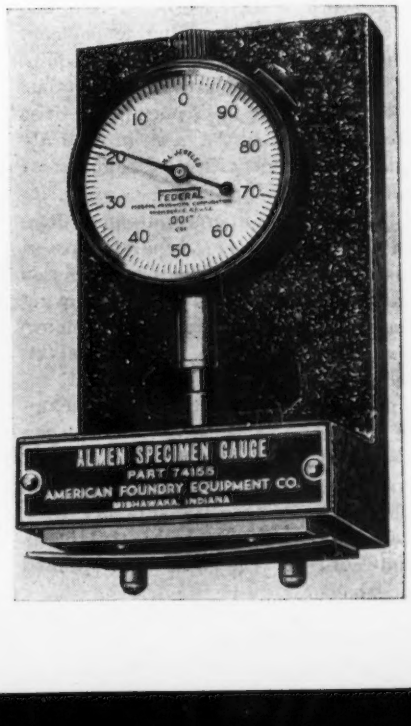
FIG. 21 — Shot intensity calibrating strip being attached to jig block which is passed through blast with parts being peened.

RIGHT

FIG. 22 — Calibration strip in position on dial indicator to measure the arc height.



# of SHOT PEENING

By O. J. HORGER
Head of Railway Engineering and Research
Timken Roller Bearing Co., Canton, Ohio

. . . The second section of a two-part article appraising the technical and economic utility of compressing the surface layers of design members as a means of greatly improving their fatigue resistance. Last week the author covered the history of shot peening, the peening of springs, and tempering after peening. Herein, attention is directed to control of shot peening, treatment of light alloys, shot size and time, liquid blast, and the peening of gears, tank parts and crankshafts.

among several investigators as to whether the arc height values are significant as an index of fatigue life. Likewise improvements in shot material and quality as well as peening equipment would be welcome. The process of peening is a relatively new field and given impetus as a result of requirements of the armed services so that the immediate wide demand for this equipment has grown faster than development and improvements would permit.

Peening Steels and Light Alloys

Forerunner of shot peening experiments reported in the literature were made by Weibel[12] on 0.225-in. diameter tempered Swedish wire. He tumbled the wire test pieces under an air blast 40 lb. per sq. in., which produced beneficial fatigue results as given in Fig. 23. Even this type of peening gave an endurance limit in rotating bending which was 24 per cent to 27 per cent greater than in the as-received condition. Endurance limit in torsion could not be obtained on the peened wire because his specimens the grips. The arrows on the torsion always developed fatigue failure in values in Fig. 23 indicate that the fatigue strength is greater than that shown by an undetermined amount.

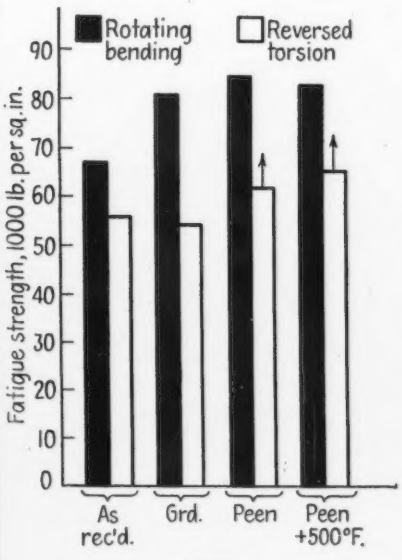
Wiegand[10] investigated the influence of different mechanical surface preparations on the fatigue strength of plain specimens ¼ in. in diameter from a heat-treated high-strength alloy steel[a]. His results are shown in Table III, and from this he concluded that there is no need for expensive polishing operations on such a high-grade steel as used in engine construction when equal fatigue resistance may be obtained by shot blasting the rough surface in C.

[a] *0.3 per cent C, 2 Cr, 0.3 Mo. and 2 per cent Ni; ultimate strength 160,000 lb. per sq. in.; elongation 9 per cent, basis 10 million stress reversals.*

Weigand[10] also studied the influence of shot blasting on the fatigue resistance of light alloys and his results are quoted in Table IV. He attributed the scatter in fatigue resistance obtained with electron castings as be-

TABLE III
Influence of Surface Preparation on Fatigue Strength

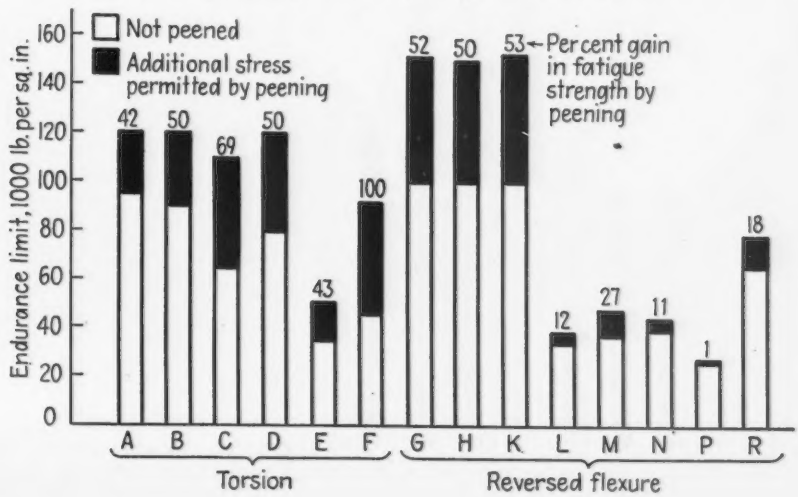
Surface Finish	Rotating Bending Fatigue Strength, Lb. Per Sq. In.
(a) Ground and polished 00	79,650
(b) Lapped	80,350
(c) Roughed with emery cloth No. 24	66,850
(d) Sand blasted, 45 lb. per sq. in. pressure, 20 min.	72,500
(e) Polished and shot blasted, 75 lb. per sq. in. pressure, 30 min.	81,100
(f) Roughed as in (c) and shot blasted 75 lb. per sq. in. pressure, 30 min.	79,650



ABOVE

FIG. 23—Effect of surface conditions on rotating bending and reversed torsional fatigue resistance of tempered Swedish wire. (All peening done on as-received wire—Weibel.)

FIG. 24—Effect of shot peening on endurance limit of various steels: (A) 0-0.85 per cent C spring wire (1); (B) SAE 1095 music wire (1); (C) 18-8 stainless wire (1); (D) 13-2 stainless wire (1); (E) phos. bronze, SAE 81 (1); (F) 18-8 stainless (Wahl 24); (G) NE 9470, carburized (24); (H) SAE 4032, carburized (24); (K) NE 9420, carburized (24); (L*) SAE 1020 plate (24); (M*) SAE 1050 plate (24); (N*) SAE 1045 annealed (18); (P*) Armco iron (18); (R*) X4340 Q & T (18). Minimum torsional stress 20,000 lb. per sq. in. except for F, which was zero. *Surface polished previous to peening—others not polished.



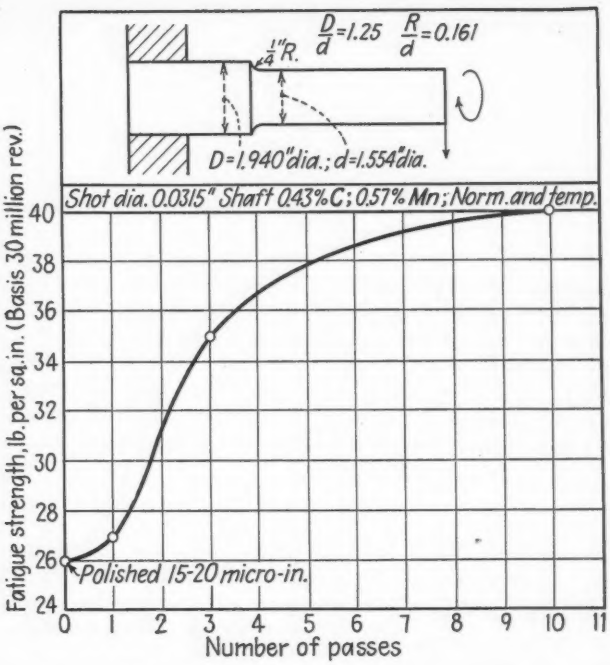

D/d=1.25 R/d=0.161
1/4"R.
D=1.940"dia.; d=1.554"dia.
Shot dia. 0.0315" Shaft 0.43%C; 0.57% Mn; Norm. and temp.
Fatigue strength, lb. per sq.in. (Basis 30 million rev.)
Polished 15-20 micro-in.
Number of passes

FIG. 25—Effect of number of passes under shot blast stream on the fatigue strength of shot peened shafts with 1/4-in. fillet.

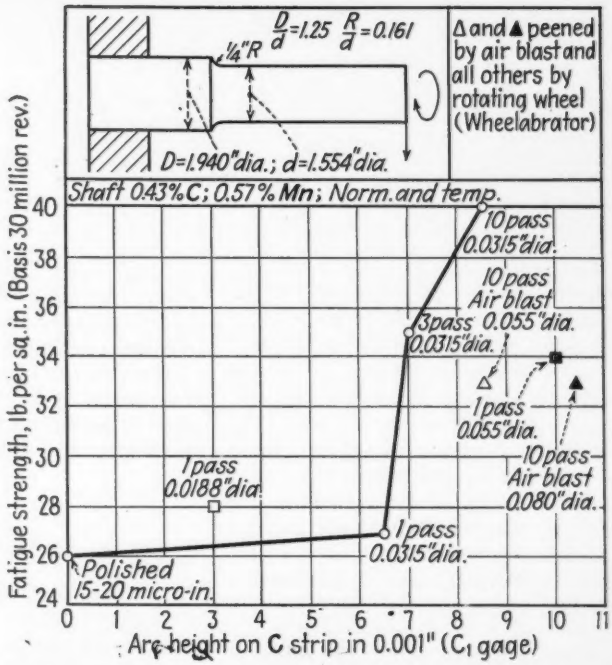

D/d=1.25 R/d=0.161
1/4"R
D=1.940"dia.; d=1.554"dia.
Δ and ▲ peened by air blast and all others by rotating wheel (Wheelabrator)
Shaft 0.43%C; 0.57% Mn; Norm. and temp.
Fatigue strength, lb. per sq.in. (Basis 30 million rev.)
10 pass 0.0315"dia.
10 pass Air blast
3 pass 0.055"dia.
0.0315"dia.
1 pass 0.055"dia.
10 pass Air blast 0.080"dia.
1 pass 0.0188"dia.
1 pass 0.0315"dia.
Polished 15-20 micro-in.
Arc height on C strip in 0.001" (C1 gage)

FIG. 26—Effect of shot size and arc height on the fatigue strength of shot peened shafts with 1/4-in. fillet.

ing no doubt due to irregularities in the castings. His conclusions stated that the endurance of aluminum and magnesium alloys could be improved as well as production time reduced for surface finish operations if such parts were shot blasted.

Further evidence of the beneficial influence of peening on fatigue resistance is shown in Fig. 24 which represents the results of several investigators. Also Lessells and Murray[18] shot peened 1/4-in. diameter plain fatigue specimens of quenched and tempered SAE 1045 and 9260 steels,[p] not shown in Fig. 24. They reported slightly lower endurance values for those plain specimens ground, polished, and peened than for those having a ground and polished surface. This reduction in fatigue resistance may be explained by improper blasting conditions, or as Lessells reported by the unfavorable surface stresses remaining from heat treatment.

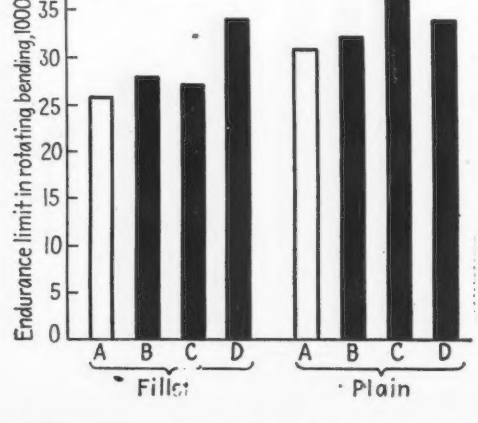
It will be noted that improvement in fatigue resistance due to shot peening has generally been expressed here in terms of endurance limit values; that is, allowable stresses for long life of say 10 million stress reversals. In some types of equipment parts, such as automobile and ordnance equipment, it is common to relate this improvement in terms of comparable life for a specific stress. Using a life basis infers a knowledge of the stresses in operation, and while these are seldom known it is customary to conduct accelerated types of fatigue tests. In order to fail parts relatively soon, a stress is used in the test which

TABLE V

Accelerated Testing to Show Life Improvement

Type of Part	Life Improvement Per Cent
Welded joints	310
Steering knuckles	475
Engine crank shafts	900
Helical springs	1370
Transmission main shafts	520
Hypoid gears	600
U joint crosses	520

[p] *SAE* 1045 *steel had ultimate strength of* 152,700 *lb. per sq. in.,* 17 *per cent elongation;* 56 *per cent reduction in area, Brinell* 311. *SAE* 9620 *steel had ultimate strength of* 322,000 *lb. per sq. in.,* 7 *to* 14 *per cent reduction in area, Brinell* 548-570.



LEFT

FIG. 27 — Endurance limit vs. shot size for only one pass of filleted and plain 1 1/2 in. diameter shafts under shot stream. (A) polished; (B) smooth turn and peened, 0.019 in. shot, arc ht. 0.003C1; (C) smooth turn and peened, 0.032 in. shot, arc ht. 0.006C1; (D) smooth turn and peened, 0.055 in. shot, arc. ht. 0.010C1.

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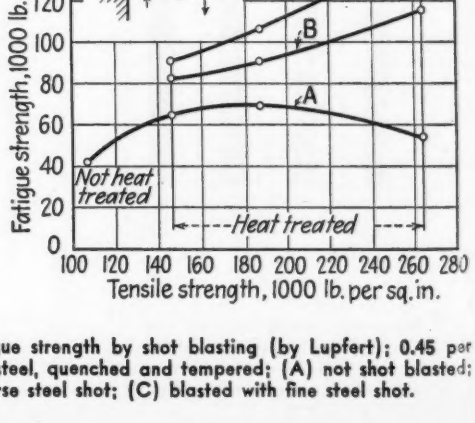


RIGHT

FIG. 28. Increase of fatigue strength by shot blasting (by Lupfert); 0.45 per cent C, 1.0 per cent Mn steel, quenched and tempered; (A) not shot blasted; (B) blasted with coarse steel shot; (C) blasted with fine steel shot.

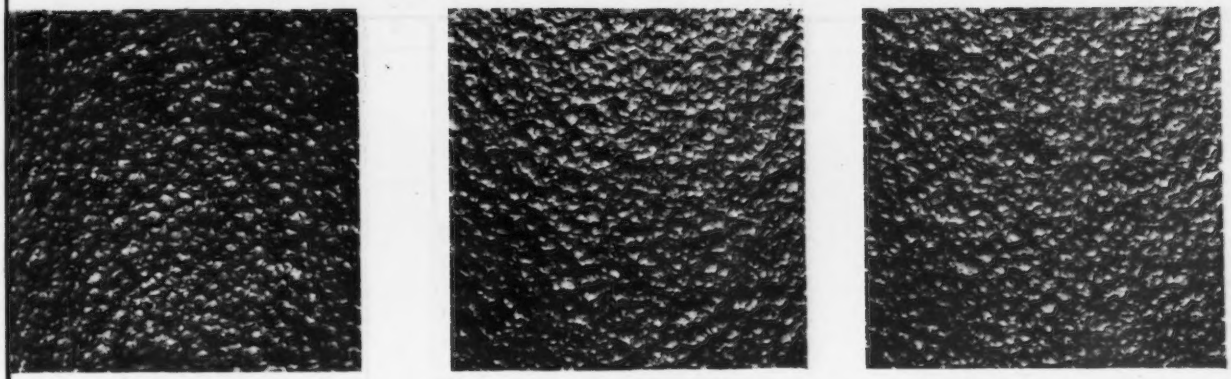

ARC HT. .0065" C1; .0175" A1
1 PASS
ARC HT. .007" C1; .018" A1
3 PASSES
ARC HT. .009" C1; .017" A1
10 PASSES
SURFACE OF SPECIMENS (X5) SHOT PEENED ON WHEELABRATOR USING .0315" DIA. SHOT.
ARC HT. .0085" C1; .014" C2
SHOT DIA. .055"-.060"
ARC HT. .0105" C1; .017" C2
SHOT DIA. .080"-.093"
SMOOTH TURNED SURFACE
(X5)
SURFACE OF SPECIMENS (X5) SHOT PEENED WITH AIR BLAST.
CONDITION OF SPEC. BEFORE SHOT PEENING.

Fig. 29—Surface finish under different peening conditions on SAE 1045.

is considerably above the endurance limit value. Depending upon the stress level chosen, life comparison values are obtained from unity to as high as infinity. Almen[5] has shown how such accelerated tests have given large increases in life through shot peening, as shown in Table V.

In any event such a life basis is often justified since it is an indication of how shot peened members will resist occasional high stresses generally found present in the operation of most equipment. It is plausible that a high stress due to infrequent overloads initiate the fatigue fracture in service and then the normal operating stresses propagate the minute crack to complete failure. A knowledge of the endurance limit is essential, however, if long life to the part is expected in service.

Shot Size and Time

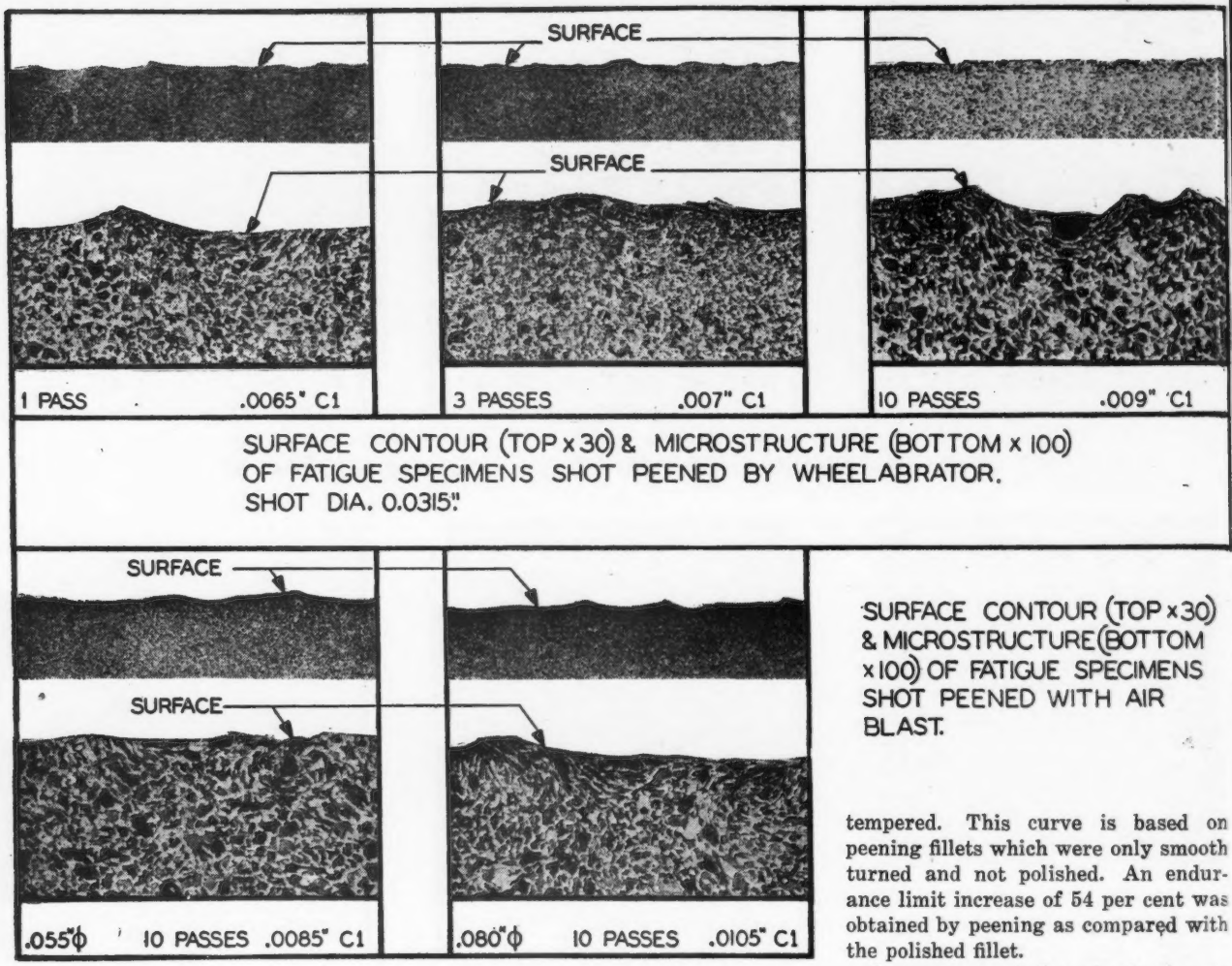
Too little systematic data exist as to the influence of shot size, time, and other factors on the fatigue resistance. In fact, much fatigue data already available lose some of their significance because of the absence of specifications concerning the conditions of blasting.

Zimmerli[1] shows the affect of blasting time on endurance values in Fig. 5 for valve springs. Fig. 25, by the author[23], also compares endurance values versus the number of passes for 1½-in. diameter filleted shafts of SAE 1045 steel, normalized and

TABLE IV

Influence of Shot Blasting on Fatigue Resistance of Light Alloys

Material	Surface Finish	Rotating Bending Fatigue Strength, Lb. Per Sq. In.
3115.5 duralumin	Fine Turned	17,100
59,700 lb. per sq. in. ultimate 38,400 lb. per sq. in. Y. P. (0.2)	Fine Turned and Shot Blasted	19,900
Electron AZ.31	Fine Turned	13,500
41,200 lb. per sq. in. ultimate 14,200 lb. per sq. in. Y. P. (0.2)	Fine Turned and Shot Blasted	17,100
Electron casting AZG	Fine Turned	5700 to 8500
19,200 to 32,700 lb. per sq. in. ultimate strength	Fine Turned and Shot Blasted	8500 to 9100


SURFACE
SURFACE
1 PASS .0065" C1
3 PASSES .007" C1
10 PASSES .009" C1
SURFACE CONTOUR (TOP x 30) & MICROSTRUCTURE (BOTTOM x 100) OF FATIGUE SPECIMENS SHOT PEENED BY WHEELABRATOR. SHOT DIA. 0.0315".
SURFACE
SURFACE
.055"ϕ 10 PASSES .0085" C1
.080"ϕ 10 PASSES .0105" C1
SURFACE CONTOUR (TOP x 30) & MICROSTRUCTURE (BOTTOM x 100) OF FATIGUE SPECIMENS SHOT PEENED WITH AIR BLAST.

o o o

ABOVE

FIG. 30—Structural conditions at surface of peened SAE 1045 shafts.

o o o

o o o

LEFT

FIG. 31 — Shot peened gear and pinion. (Simon).

o o o

tempered. This curve is based on peening fillets which were only smooth turned and not polished. An endurance limit increase of 54 per cent was obtained by peening as compared with the polished fillet.

Consequence of shot size is also reviewed[23] in Fig. 26. Here the arc height is correlated with endurance limit obtained for filleted shafts. It must be observed that the smaller shot size is more beneficial than the larger sizes but these findings only apply to the conditions investigated. Further data in Fig. 27 show that if the filleted shafts in Fig. 25 are given only one pass under the shot stream then the larger size shot is more beneficial[22]. In Fig. 27 the 1½-in. diameter plain specimens without fillets stress concentration, however, gave the best endurance with the medium size shot. Other unpublished data exist which indicate that the larger size shot is more beneficial when stress concentration due to shape of the member is present. These above curves are expressive, however, of the fact that all peening conditions on smooth turned filleted or plain shafts gave improved fatigue resistance over those having polished surfaces. Obtaining the optimum endurance requires fatigue tests on the material, design, surface, and blasting conditions concerned with each production part.

A measure of the degree of cold work accomplished by peening is the

arc height but it is apparent from Figs. 26 and 27 that there is poor correlation of arc height with endurance. Additional unpublished data confirm this lack of correlation but further data on this question are desirable.

Lupfert[20] also found smaller size shot to give greater endurance than larger shot, as shown in Fig. 28.

That a smooth surface does not necessarily connote the most favorable endurance is obvious from Figs. 29 and 30. These studies all pertain to the surface conditions found on the filleted and plain shafts reported in Figs. 25, 26 and 27.

Peening of Tank Gears

Simon[38] shot peened gears in Fig. 31, which are part of the electric drive system of railroad diesel locomotives illustrated in Fig. 32. These gears

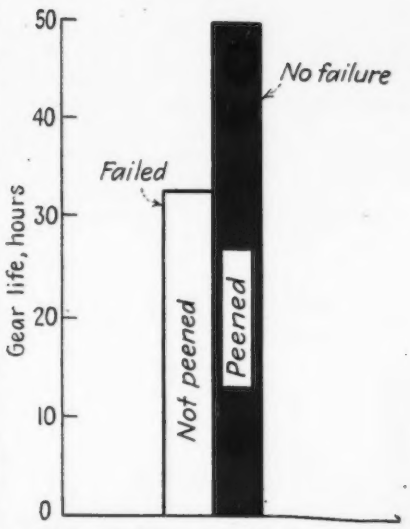


FIG. 33—Idler gear life increased on M4 medium tank from dynamometer tests. (Col. J. H. Frye.)

are peened as a last production operation after the teeth were previously finished to dimensional accuracy.

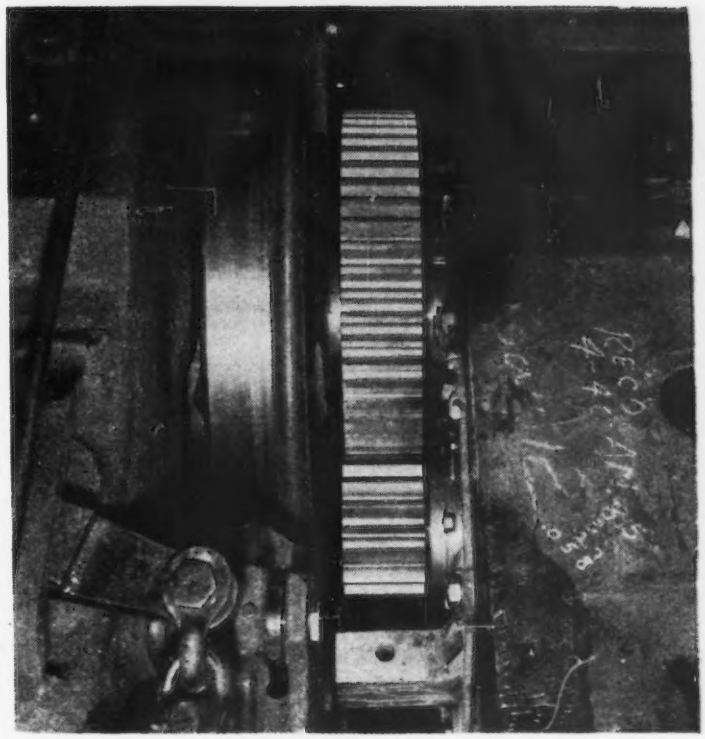
Some high duty gears have the teeth cut with a protuberance hob and, after shot peening, the mating surfaces on the sides of the teeth are ground. This method leaves the root radius in a peened condition to better resist fatigue fractures.

Some data on increased life of idler gears for M4 tank by shot peening were presented[38] by Frye[q] in Fig. 33. The tests on the peened gears were discontinued after 49½ hr. without

[q] *Col. J. H. Frye, Ordnance Department, U. S. War Department.*

[r] *E. E. Boden, Experimental Engineer, Timken Roller Bearing Co., Canton, Ohio.*

A profilograph was used to obtain all finish records.

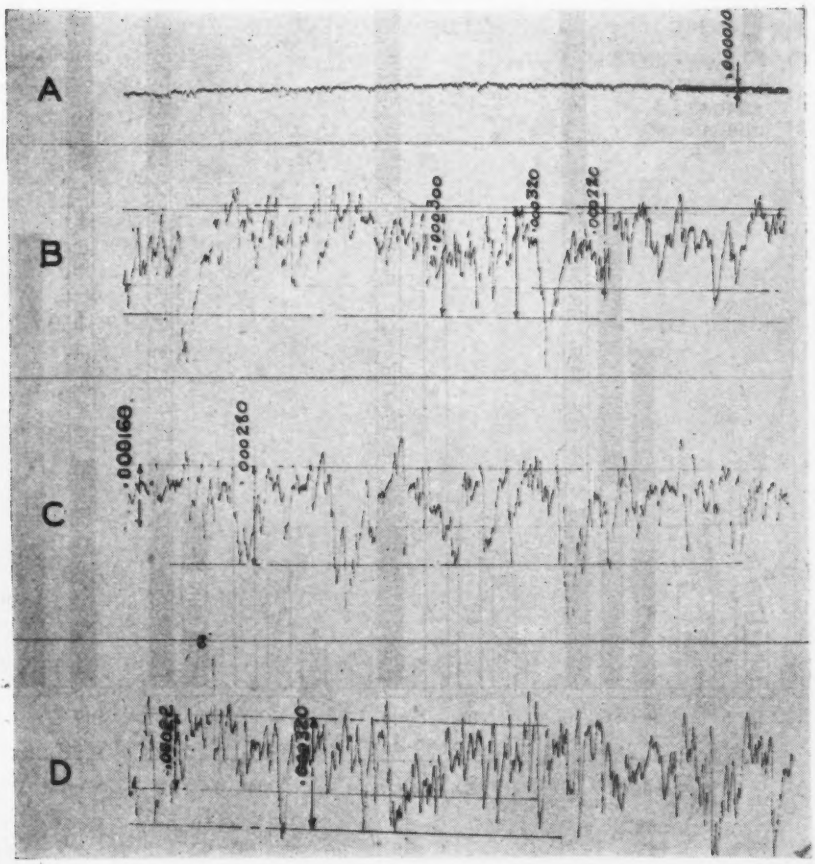


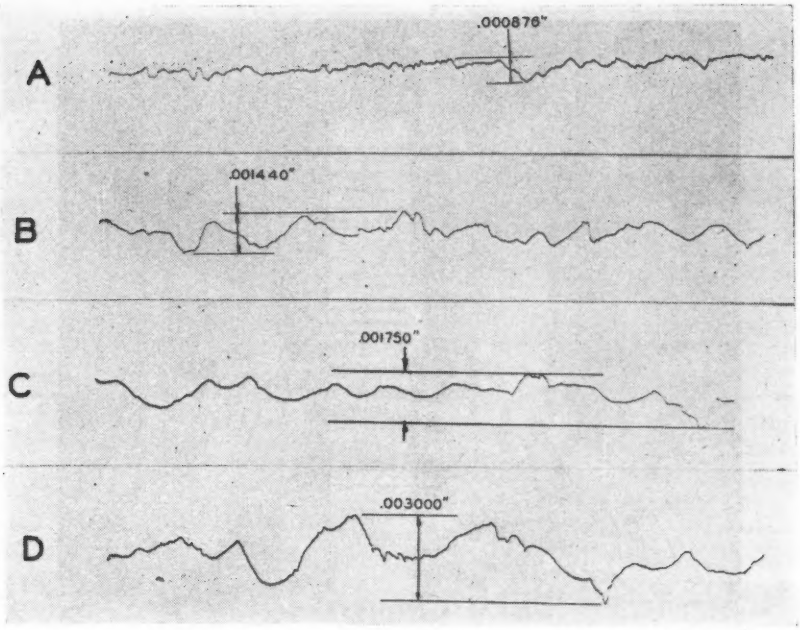
ABOVE

FIG. 32—Diesel locomotive electric motor driving gears are shot peened. (Simon)

BELOW

FIG. 34—Influence of time of blast on surface finish of case carburized parts. (Boden) (A) honed; (B) shot peened 90 sec.; (C) shot peened 5 sec.; (D) shot peened 15 sec. Vertical magnification, 3000 X diameters; horizontal, 30 X diameters; 0.023 in. shot size.





ABOVE

FIG. 35—Influence of different shot size on surface finish of case carburized parts. (Boden). (A) 0.020 in. shot size; (B) 0.033 in. shot size; (C) 0.055 in. shot size: (D) 0.094 in. shot size.

failure, whereas non-peened gears failed after 33 hr. Shot size was 1/32 in. with an intensity of 0.16A1.

Boden[7] studied the irregularities of surface finish illustrated in Figs. 34 and 35 on case carburized parts which were shot peened under various conditions on a Wheelabrator using different sizes of chilled iron shot and with different time under the blast. Some design members require certain characteristics as to dimensional accuracy, lubrication, friction, and noise so that a knowledge of these surface irregularities become necessary.

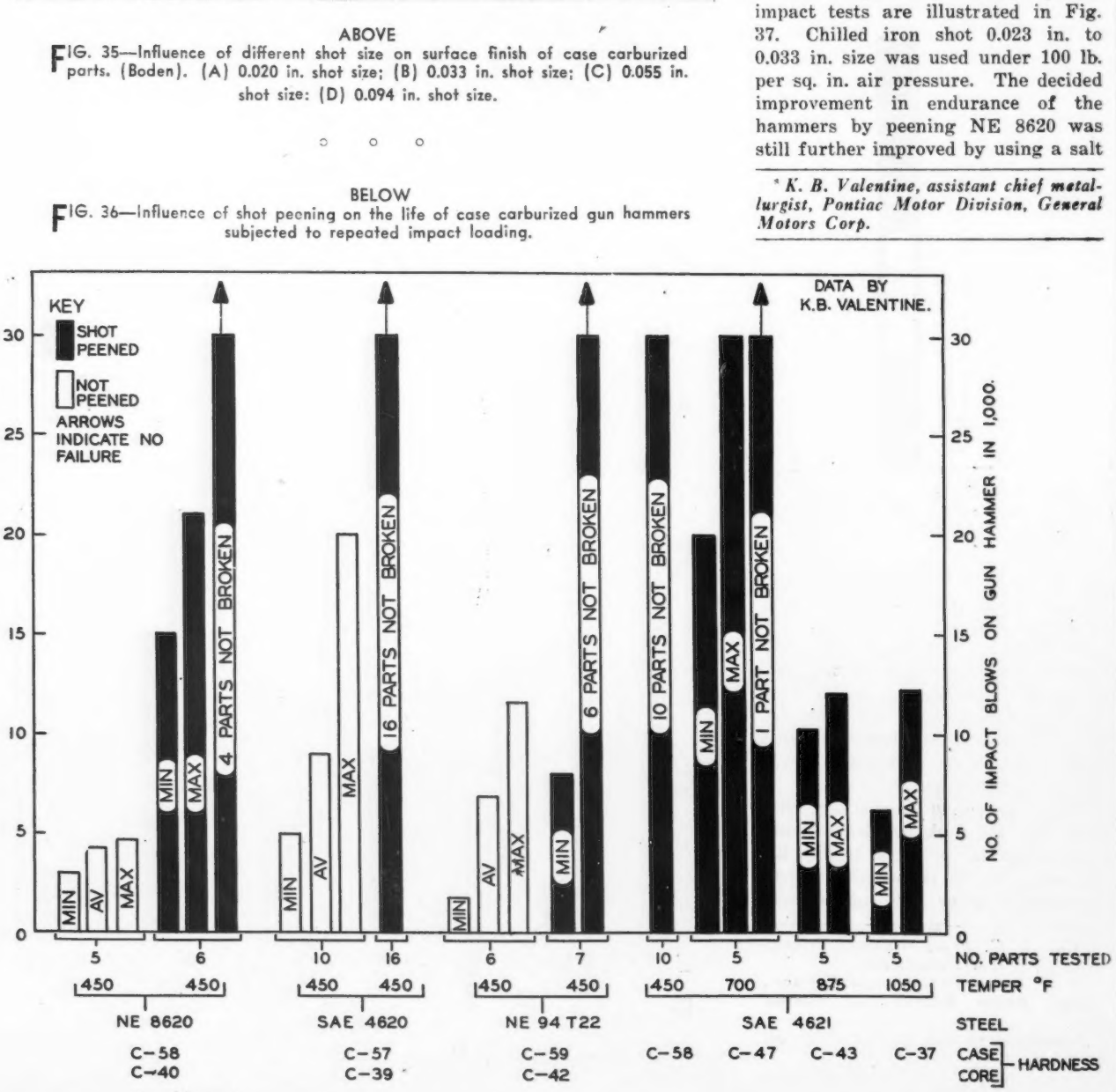
Improvement of Gun Parts

Valentine* presented a clear picture of how shot peening greatly improved the impact fatigue resistance of hammers used on automatic guns. His results given in Fig. 36 are quoted from tabular data[29]. Typical hammer fractures developed in laboratory repeated impact tests are illustrated in Fig. 37. Chilled iron shot 0.023 in. to 0.033 in. size was used under 100 lb. per sq. in. air pressure. The decided improvement in endurance of the hammers by peening NE 8620 was still further improved by using a salt

* *K. B. Valentine, assistant chief metallurgist, Pontiac Motor Division, General Motors Corp.*

BELOW

FIG. 36—Influence of shot peening on the life of case carburized gun hammers subjected to repeated impact loading.



bath quench at 480 deg. F. followed by shot peening (not shown in Fig. 36). Under this later treatment 15 hammers were tested of which 14 were not cracked after 40,000 impacts and one failed after 24,000 impacts. This case illustrates that the structure previous to peening may be important because Valentine observed that hammers failing at a low number of cycles (NE 8620; salt bath quench 450 deg. F.) had a mixed acicular and brittle structure while those parts which did not fail after 30,000 impacts had small amounts of spheroidal carbides at the surface. The 480 deg. F. salt bath quench was not as critical and produced the desirable spheroidal carbides and resulted in the best endurance values.

Rifle extractors from WD8745 steel were improved by shot peening, as found by Colonel Frye[38]. Fig. 38 shows the same test results obtained on extractors under both conditions of (a) Rc 50 surface peened with 0.013 to 0.017-in. shot and intensity of 0.0085A1, and (b) Rc 40 surface peened with 0.019 to 0.024-in. shot and intensity of 0.0138A1. He observed that at lower hardness values it appeared that the endurance life increased with increased intensities, but at higher hardness values the greater intensities tend toward decreased life. This same comment applied to other parts which Frye investigated.

Frye gave further examples[38] of improvements in life of gun parts shown in Fig. 39. The extractors were forged from WD4340 steel and surface hardness after heat treatment was Rc 43-48. An intensity of 0.012A2 was obtained with 0.016-in. chilled iron shot. The average life of 1580 rounds on 39 samples not peened was increased to 12,000 rounds by peening.

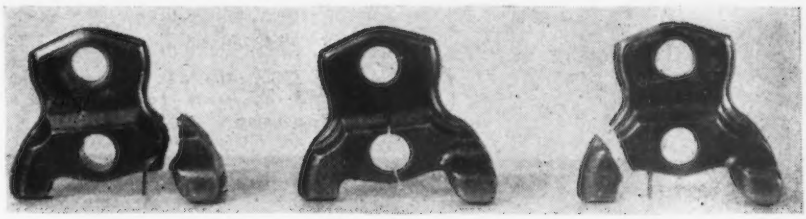


Fig. 37—Typical fatigue fractures of gun hammers. (Valentine.)

On the firing pins he remarked that checking heat treatment and polishing fillet radii resulted in no improvement but peening with 22 mesh shot gave the greatly improved values in Fig. 39.

Peening of Crankshafts

Highly stressed areas of crankshafts are shot peened as shown in Fig. 40. The critical areas are normally the fillets adjoining the ends of the bearings on the main and crank journals. Assuring proper peening conditions in the desired locations is accomplished by the mechanical handling arrangement in Fig. 41. While situations vary it is common to use 0.0243 to 0.0315-in. diameter shot and the crankshaft rotates about its own axis at 30 r.p.m. and the forward travel under the shot stream 2.5 ft. per min. An intensity of cold work equal to 0.020A2 is obtained as measured on the Almen gage. The wheels slinging the shot on the Wheelabrator unit are 19½ in. in diameter by 2½ in. wide rotating at 2250 r.p.m.

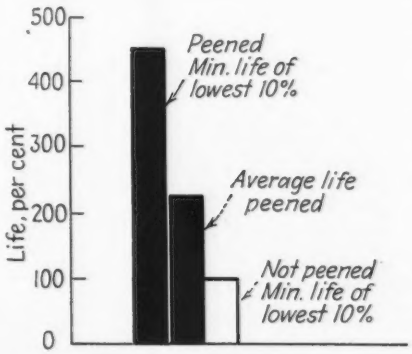
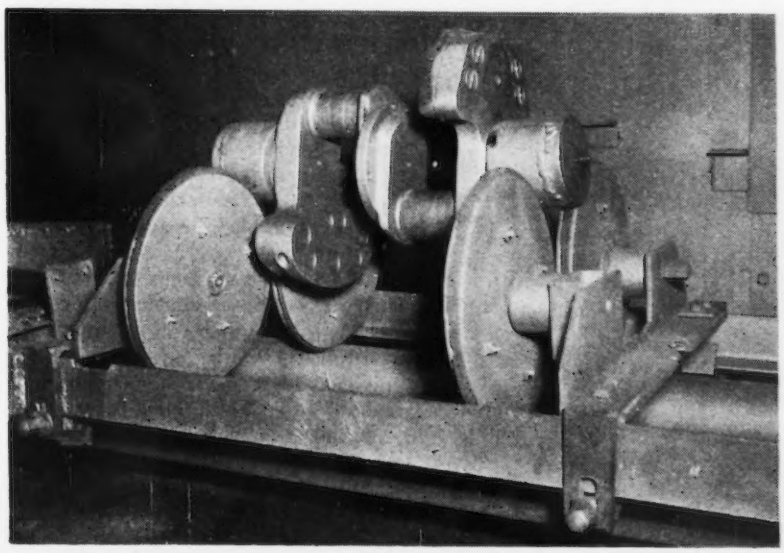


FIG. 38—M1 rifle extractor improved in life. (Col. J. H. Frye).

Studs and Bolts

Studs and bolts subjected to high stresses and particularly repeated impact loading are necked down in the body portion. The engineering value of such design is illustrated in Fig. 42 where Staedel[40] reported large increases in repeated impact fatigue resistance resulting from enhanced flexibility. Ordinarily common bolt designs develop fatigue fracture in the threaded portion or under the head but when maximum impact capacity is embodied in the bolt by necking down then failure may place in the reduced body portion. To reduce the danger of such body failure this portion is shot peened. Fig. 43 exhibits bolts and studs which Simon[35] peened before the threads are cut. Peening

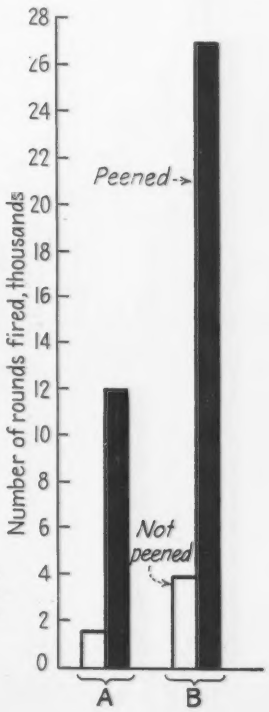


RIGHT

FIG. 39—Average life of gun parts increased by shot peening: (A) Bofors 40 mm. gun extractor, (B) 105 mm. howitzer, M3, firing pin holder. (Col. J. H. Frye).

LEFT

FIG. 40 — Crankshaft in position in shot peening cabinet.



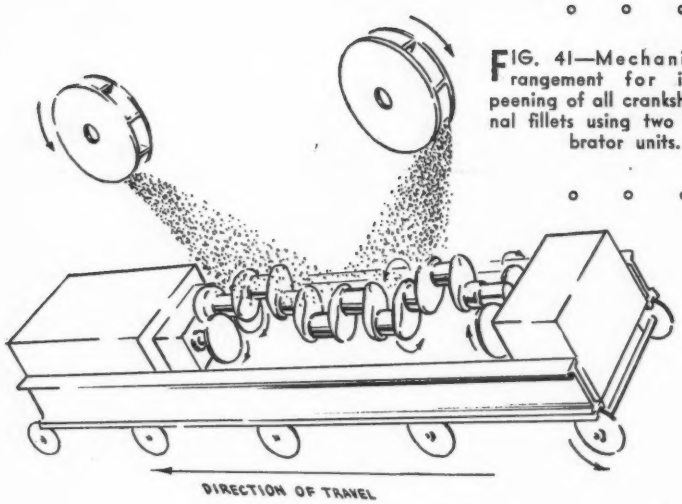


FIG. 41—Mechanical arrangement for insuring peening of all crankshaft journal fillets using two Wheelabrator units.

is applied directly to a machined surface rather than grinding same.

Tank Track Pins

Tank track pins are shot peened in production as shown in Fig. 44. Frye[38] stated that definite and material increase in fatigue life has been obtained by peening. Solid and hollow pins of various alloy steels were investigated using shot size from 0.018 to 0.130 in. and improvement always resulted. Optimum conditions, however, were not revealed. It is not at all surprising to find such improvement because fundamentally this problem involves increasing the fatigue resistance in local regions of fillets and clamped portions where

BOLT DESIGN	BOLT BODY		BOLT BODY AREA IN % OF AREA AT ROOT OF THREAD	REPEATED IMPACT FATIGUE LIMIT					
				STEEL A		STEEL B		STEEL C	
	DIA, IN.	AREA, SQ. IN.		IN. LB.	%	IN. LB.	%	IN. LB.	%
1	15/32"	0.175	230	1.73	100	1.73	100		
2	25/64"	0.122	160	2.60	150	2.26	130	~2.17	100
3	5/16"	0.076	100	4.34	250	2.78	160	~3.47	160
4	9/32"	0.060	78	5.21	300	2.95	170	5.21	240
5	15/64"	0.044	57	6.51	375	3.65	210		

	%C	%Mn	%P	%S	%Si	ULTIMATE (PSI)	YIELD (PSI)	% ELONG.	% RED. AREA	BOLT ULT. *
STEEL A	0.15	0.65	0.095	0.186	0.04	78200		12.8	56.0	93900
STEEL B	0.25	0.75	0.019	0.024	0.25	96400		12.8	54.0	118900
STEEL C	0.33	0.70	0.039	0.027	0.18	85300				
						99600	>68300	16-10		118000

* Static tensile strength of actual bolt, design 2, having 5/32" length of free threads under nut

FIG. 42—Effect of body diameter of bolt and bolt steel on the repeated impact fatigue strength of bolts. (By Staedel).

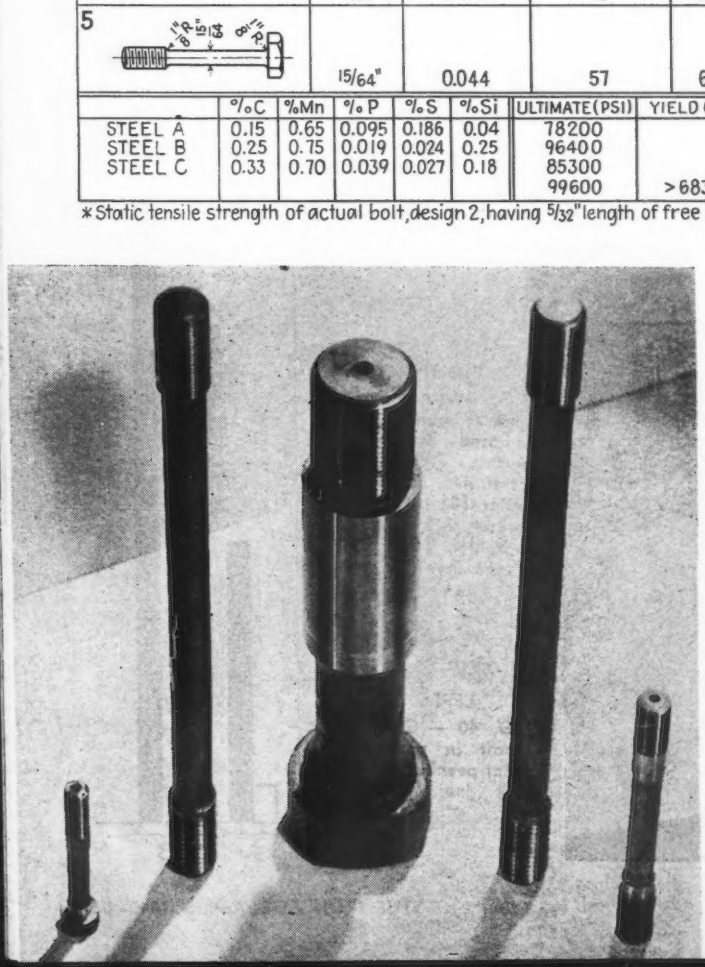


FIG. 43—Bolts and studs shot peened in reduced diameter body portion. (Simon).

cold working of such surfaces has previously been found beneficial.

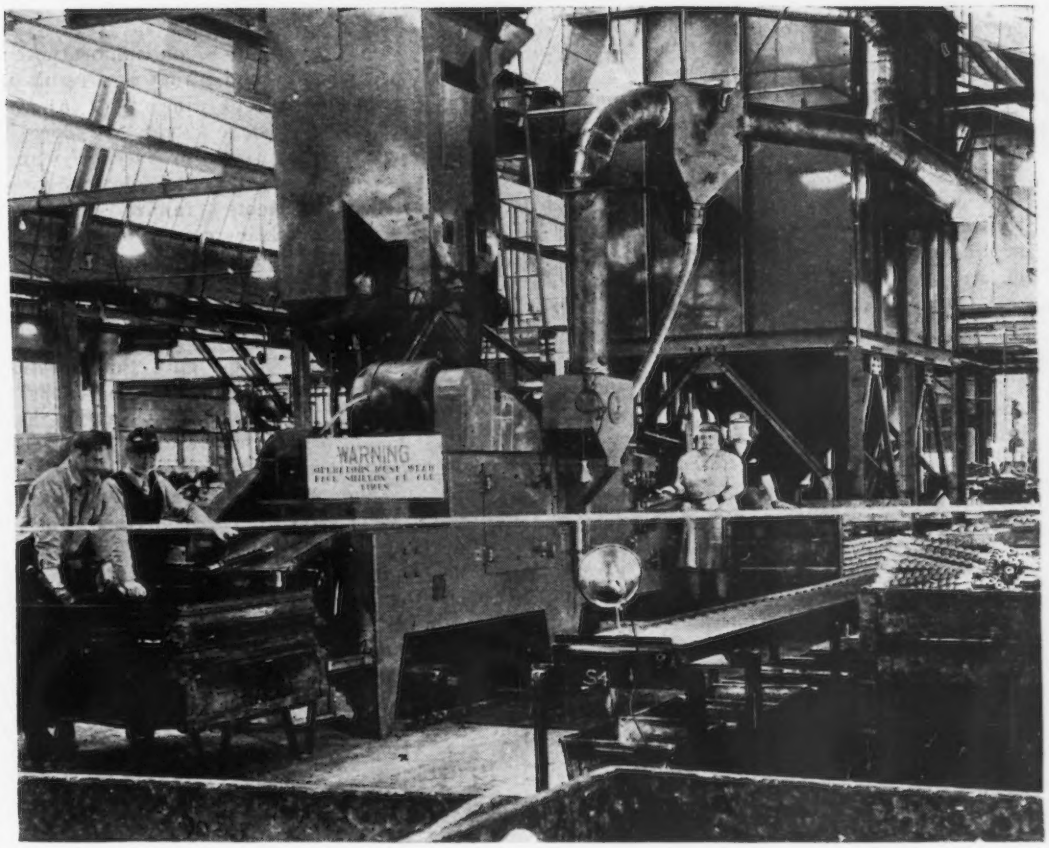
Liquid Blast

Very little data of a technical nature have been made available regarding the liquid blast method of surface finishing. By one liquid blast process an abrasive is mixed with a liquid and an agitator type of pump forces this mixture through guns or nozzles in a blast against the part. Grinding marks can be removed from case carburized surfaces by the liquid blast as shown by Boden in Fig. 45. Here a ground surface was prepared by several grinding passes to a final finish of 16-18 micro-in. profilograph reading. A liquid blast containing 1250 mesh abrasive modified this ground surface as illustrated in Fig. 45. That this method actually removes metal in the matter of seconds of exposure from a surface ground

o o o

FIG. 44 — Tank track pins shot peened.

o o o



after case carburizing is substantiated by the profilograph of the surface finish in Fig. 46. One portion of such a ground surface was masked during the liquid blast and the profilograph trace was made over both finishes. The step in the trace indicates that 180 micro-in. was removed from the ground case carburized surface by the liquid blast.

Outside of the strengthening influence obtained by removing grinding marks and improving surface conditions it is not known what additional contribution to fatigue resistance, if any, would result by the peening effect. Almen strips have shown curvature after blasting but no fatigue data are yet available. In the meantime this process is serving in production lines as a means of surface finishing and warrants investigation as to its influence on fatigue resistance.

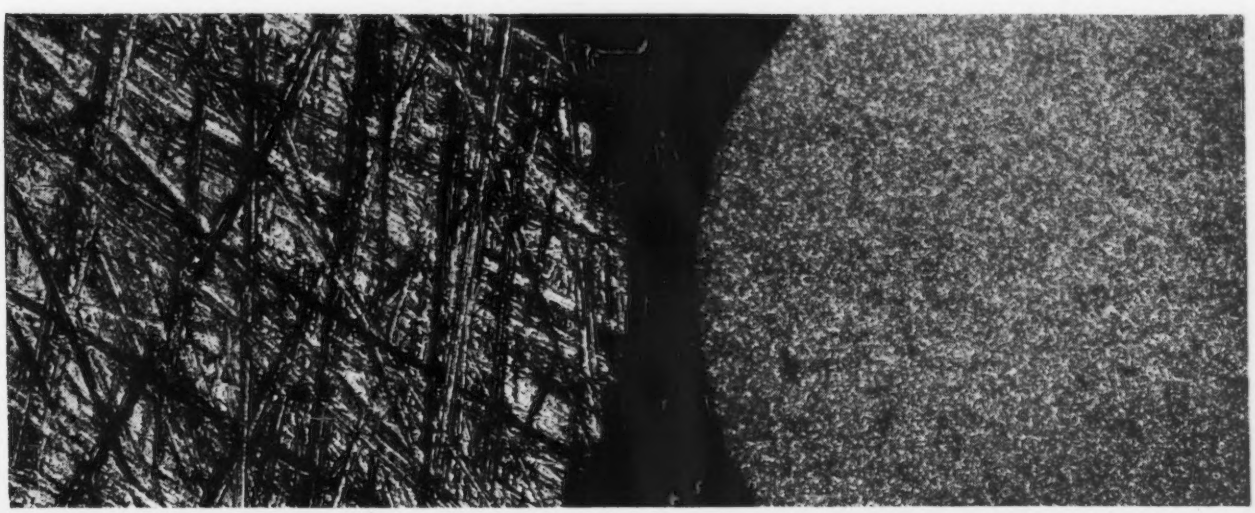
Three reasons submitted in explanation for the improved fatigue properties obtained through various surface compression methods such as shot peening or surface rolling are briefly:

(1) Residual compressive stresses are obtained in the surface layers where the applied stresses are usually a maximum and such residual stresses counteract the dangerous tensile stresses arising from operation[5, 41]. The hypothesis[42] for the effectiveness of residual compressive stresses at the surface is that (a) the zero-to-maximum fatigue resistance of steel is greater with compressive loading than with tensile loading, and (b) under the influence of external forces occuring in operation a non-uniform stress distribution arises.

(2) Physical and metallurgical properties of the surface skin are altered by which the surface layer may be densified, grain structure

o o o

FIG. 45—Surface conditions on case carburized surface before and after liquid blasting, at 100 diameters. Left, multi-pass ground surface; right, after liquid blasting. (Boden.)



changed, damping capacity influenced, elastic limit and notch sensitivity decreased[7, 43, 44, 45, 46].

(3) The free grain boundaries protruding to the surface of a design member are more vulnerable to fatigue failure than grains below the surface. It is conceivable that at and near the surface, where yielding and fracture by fatigue will be initiated, the crystal grains are less constrained by grain boundaries than those situated farther away[47]. While crystal aggregates are considered as isotropic, it is probable that the properties are not uniform in all directions. Surface compression may improve this nonuniformity of properties and the specific elastic shear strain energy (criterion often considered for mechanism of failure) for the surface grains may approach the higher values possibly characteristic of the grains within the body[47]. This is worthy of note particularly on decarburized surfaces when there is a hint of sub-microscopic loosening of the structure[19].

It should be stated at the outset that no investigator has yet submitted factual evidence which would permit positive conclusions as to which one of the three above reasons is responsible. In fact there is better evidence to suggest the possibility of at least the first two arguments acting jointly to give beneficial increases in fatigue resistance. In some cases all three arguments may apply or any combination of the three. It should not be mistaken, however, that any difference of opinion exists as to the favorable effect of cold working on fatigue resistance for there is none; but there is no uniformity of opinion as to why fatigue strength is increased. While this question is of academic interest it is believed that a better knowledge of surface compresson would also be of practical importance in controlling, applying, and obtaining optimum fatigue strength and life of design members. Therefore the research results bearing on this question will be presented.

Thum since the early 1930's has credited the first theory regarding residual stresses for the improvement in fatigue resistance. His more formal implications made in 1935 were[42] that as a result of surface cold working the (a) residual compressive stresses reduce the tensile stresses produced by an external load, (b) shear stress is reduced and fatigue failure is usually predicated on some form of shear theory and (c) stress gradient and magnitude of stress peak are decreased so as to reduce the danger of permanent deformation. Thum made fatigue tests to investigate this question and found[41] that (1) four-fifths of the increased fatigue strength in reversed bending was due to residual stresses and one-fifth was due to strain hardening, while (2) increased torsional fatigue strength was all due to strain hardening. These conclusions were based on the results of fatigue tests made on torsion and bending specimens of the type given in Fig. 47. Some of these specimens were prepared in a special manner by first rolling the 0.030-in. radius groove after it was machined in solid bars. Then these bars were bored out so that the remaining residual stresses were negligible and only

(CONTINUED ON PAGE 146)

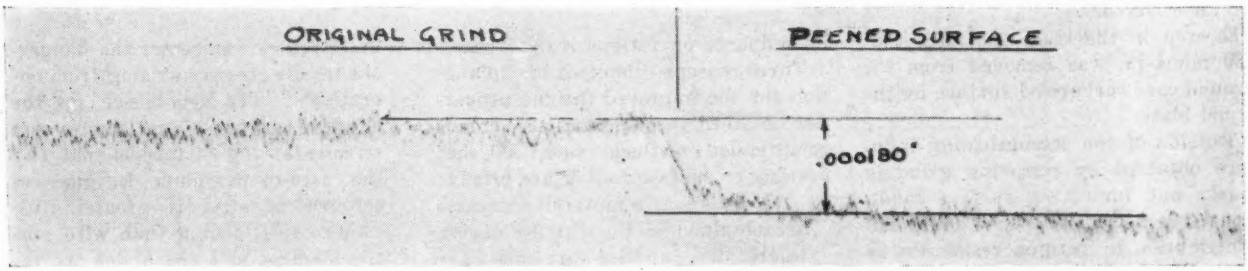


FIG. 46—Profilograph record of case carburized surface indicating removal of 180 micro-in. of metal by liquid blast. Vertical magnification 3000 diameters, horizontal 30 diameters. (Boden.)

FIG. 47—Fatigue specimen used to determine influence of strain hardening and residual stresses. (A) bending specimen, (B) torsion specimen.

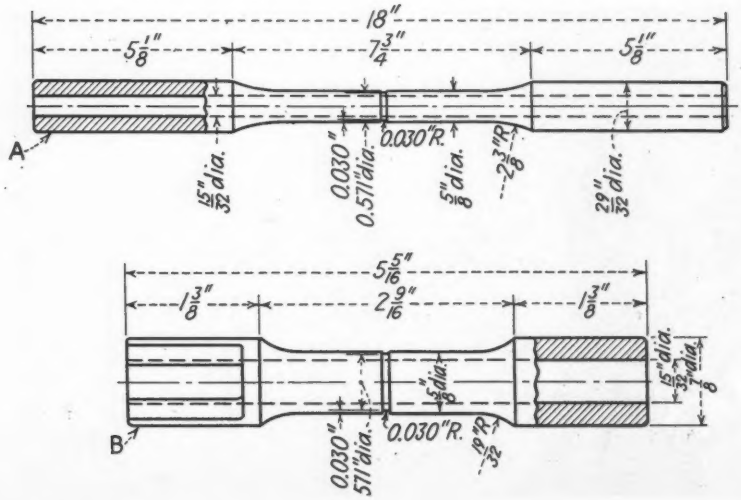
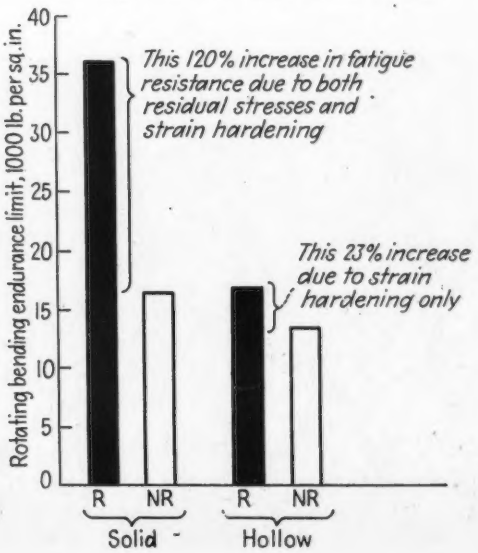


FIG. 48—Bending fatigue resistance influenced by surface rolling; hollow specimen was bored out after rolling. R = rolled and NR = not rolled.



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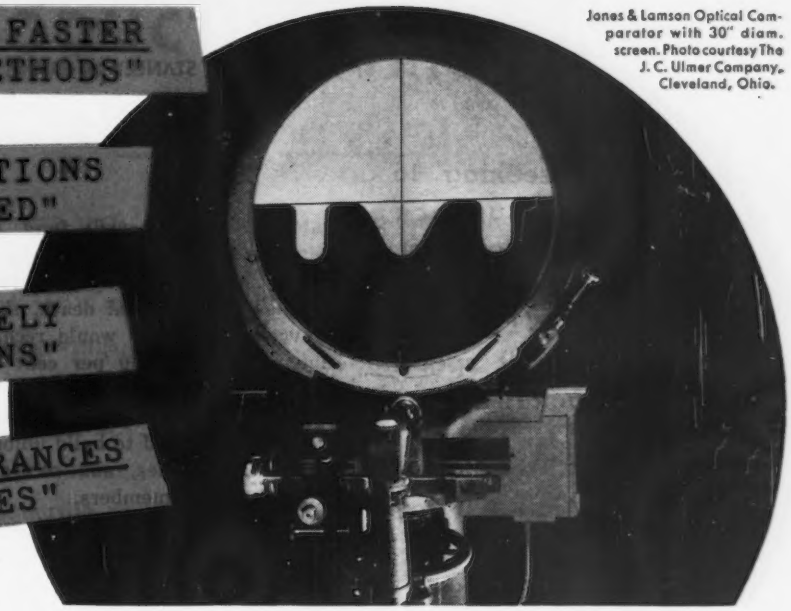

Jones & Lamson Optical Comparator with 30" diam. screen. Photo courtesy The J. C. Ulmer Company, Cleveland, Ohio.

This, in brief, is what a manufacturer of precision tools and gauges has to say about *his* Jones & Lamson Optical Comparator. The record speaks for itself, but it is just one of hundreds of instances where the use of these Comparators has resulted in inspection economies, better products and satisfied customers.

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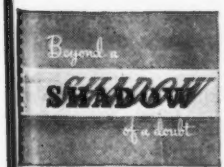

This book "Beyond a Shadow of a Doubt" will tell you more about our Optical Comparators and what they are doing.

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STANLEY H. BRAMS

• UAW is seeking to install an insurance program for members, to be paid for by the companies . . . Foremen bargaining will speed at auto factories and steel mills.

DETROIT—The CIO United Automobile Workers union has touched off a full-scale drive for broad insurance coverage for its member workers in automotive plants, the entire cost to be paid for by the companies. The proposal will be first introduced to General Motors Corp., having been authorized last week end at a special meeting of the General Motors council of the union, and it will then be presented to other company managements as rapidly as feasible.

Companies will be asked to set aside a sum equal to three per cent of each worker's pay for a social security fund. This three per cent would not be a deduction from pay envelopes, but would be a contribution by management—in effect, a wage advance of that amount, if looked at from one standpoint. Only members of the UAW, however, would participate in the plan—a rather well-devised means of increasing membership and holding it. The fund, it will be noted, would be administered by the union.

Two-thirds of the three per cent would cover the cost of hospital, surgical, and medical care of the employee, including 50 doctor calls either in the home or in the office. After the first week of illness the employee would receive lost-time compensation, equal to 60 per cent of his weekly wage for the period of his illness, up to 52 weeks in any one year for any one illness or accident. The remaining third of the fund would be used to establish a death benefit fund, out of which the beneficiary of any employee would receive a flat payment of $1,500. In case of accidental death, the employee's beneficiary would receive an amount equal to 60 per cent of his weekly wages for a period of 60 weeks. Reserves which might accumulate would be used to build union hospitals, rest homes, and recreational centers for the members.

This life, sickness, accident, and disability coverage would be provided by the Trade Union Accident & Health Association of New York. It would be supplemented by a continuation of family coverage policies now placed with non-profit organizations such as Blue Cross, with family coverage to be paid for by the worker himself through payroll deductions. The plan will be brought up at a meeting of the international union board at its next meeting, or at a special meeting called beforehand.

THE idea is not unprecedented. The Amalgamated Clothing Workers Union and the International Ladies' Garment Workers Union have similar plans in effect. At the same time, it is obvious that any proposal to install a program of this sort in the automotive plants will be resisted by managements on the grounds that it would constitute a major drain on income and profits. There may be some justification, also for War Labor Board's opposition to the idea as a circumvention of wage stabilization. Certainly in an industry without precedent in matters of this nature, a three per cent levy paid by managements for worker benefits is in effect a pay raise whose proceeds are frozen. At the same time, the intention to use any surplus accumulating in the social security fund for union purposes must be construed, as following along the "royalty" lines of the John L. Lewis proposal for a flat levy of 10c. a ton on coal mined by members of his labor organization, as a contribution to the union.

The most celebrated instance of union insurance in the auto industry was at Ford Motor Co. starting in 1941. A company administered broad coverage plan was setup with Travelers Insurance Co., providing health, accident, death, and hospitalization benefits, with a portion of the premium paid by the company. One year later, in February 1942, the company discontinued this sponsorship, and the UAW took it over for handling through John Hancock Insurance Co., with entire premiums paid by the workers. For a time this program included the bulk of the employees at the Rouge, but has since languished, although it is still an important piece of business.

JOINS FORD: *W. S. James has joined Ford Motor Co. as director of engineering research, working directly under R. H. McCarroll, executive engineer of the company. James has been chief engineer of Studebaker Corp., South Bend, Ind., is a Past President of the Society of Automotive Engineers, and is considered one of the top men in his field.*

AS expected, foremen's unions have been recognized by the National Labor Relations Board as proper bargaining agents for supervisory employees, reversing the 1943 Maryland Drydock decision, and as a result an election will be held within 60 days to determine whether the Foreman's Association of America, independent union, should represent about 1100 supervisory employes at Packard Motor Car Co. It appears to be a foregone conclusion that the FAA will be chosen to represent the men

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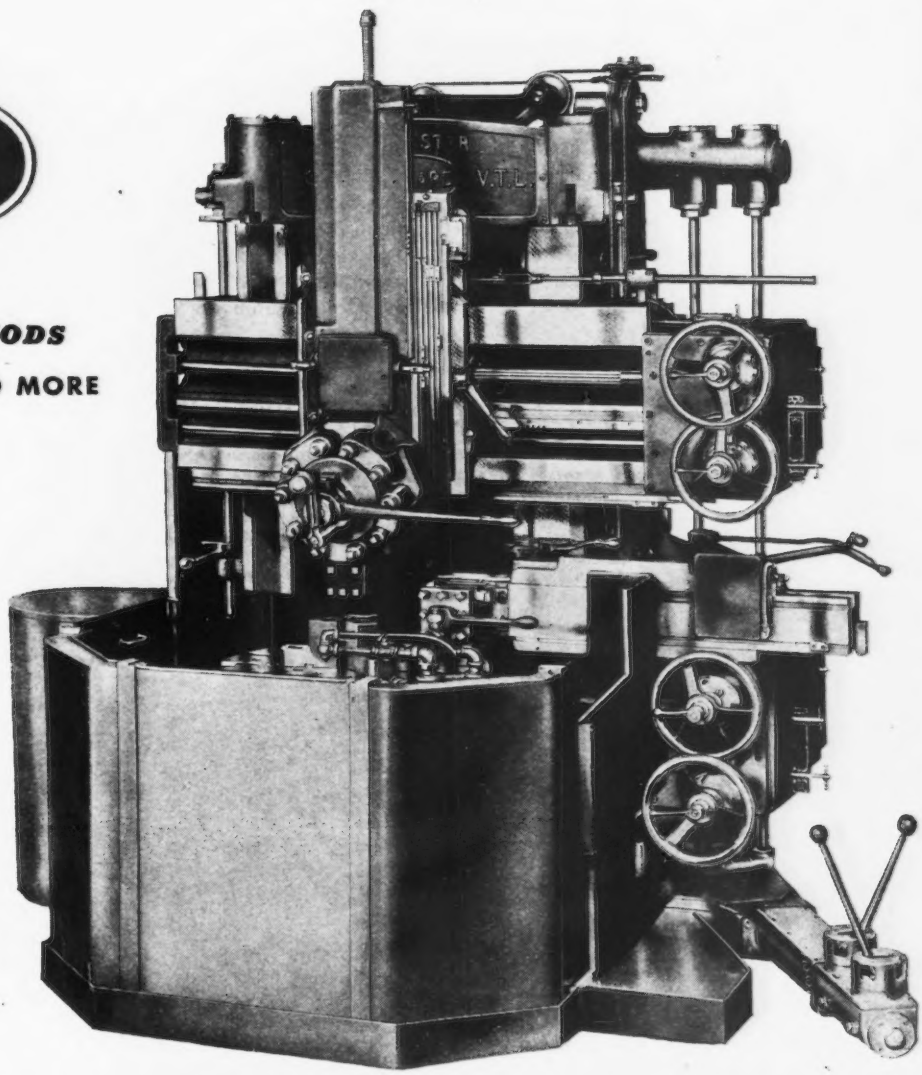


BULLARD 36″ CUT MASTER VERTICAL TURRET LATHE with swiveling main turret head and non-swiveling side head. 20 table speeds. Built-in 3-jaw combination chuck or 4-jaw independent chuck. Each feed unit has 16 feeds ranging in geometric progression from .0026 to .500 per revolution of work spindle.

who selected that union as their bargaining agent, by a vote of 486 to 2 in a consent election on February 1943. This was subsequently invalidated by the Maryland Drydock decision holding that foremen were part of management and thereby not entitled to Wagner Act protection.

The success of the FAA in reversing the position of the Labor Relations Board is expected to touch off an instant and aggressive organizing drive in Detroit, with immediate petitions for elections to be filed in other plants including those of Chrysler Corp., Briggs Mfg. Co., and Murray Corp. of America. The FAA already has a contract with the Ford Motor Co., signed voluntarily last year by the management. In all, the FAA claims upward of 25,000 members in approximately 90 plants, and has opened a Chicago district office to organize steel mill supervisors, who have evinced considerable interest in the development.

As a result of the FAA success, some high and fancy title juggling on the part of management and union alike can be anticipated. On its side, management will attempt to circumvent the decision by creating a greater number of superintendents, assistant superintendents and such higher bracket officials, than ever before. In rebuttal, the FAA can be expected to extend its organizing tentacles to the ranks of the superintendents as well as the foremen.

Industry, however, is planning a more direct reaction to the NLRB finding in favor of the foremen. Court action to determine the validity and justification of any order to bargain will undoubtedly be taken in the Federal Circuit Court of Appeals, if not by Packard, then by other firms in the auto industry acting as friends of the court. Of course this could be contingent only on Packard's refusal to bargain after an election, but evidently the rest of the industry will make strenuous efforts to persuade Packard to take a position enabling the whole matter to be threshed out judicially.

The fact remains that management must have some representation in the shops upon which it can depend without fear of union adherency. Probably not even the unionists will dispute this. On the other hand, something must be said in all fairness for the positions of foremen who find themselves squeezed between conflicting demands of management and labor, under which their problems have multiplied and their positions become more jeopardized with the war years.

Organizing or supervisory employees can be expected to be well received at this time, when cutbacks are in the air. Greater numbers of workers have been upgraded to supervisory jobs than ever before in industrial history, and they are anxious to retain those posts and the higher pay that goes with them. Organization into a union will be seen by these younger men as one way of achieving protection. On the other hand, older supervisory employees will also see the unions as a means of guaranteeing seniority to hold their jobs against the inroads of the younger newcomers. The cards seem certainly stacked in favor of the FAA at this time.

Packard Planning Research to Use Thermal Jet Units

Toledo, O.

• • • **Arthur Nutt**, director of the Aircraft Engineering Division of the Packard Motor Car Co. revealed last night the company is preparing to include research in gas turbines and jet propulsion engines in its advanced aircraft engine developmental program undertaken at the request of the Army Air Forces.

Speaking at a dinner here recently the Packard official described for the first time the scope of the company's developmental program to be carried out with augmented facilities nearing completion at its Toledo division and the Willow Run Army Air Base.

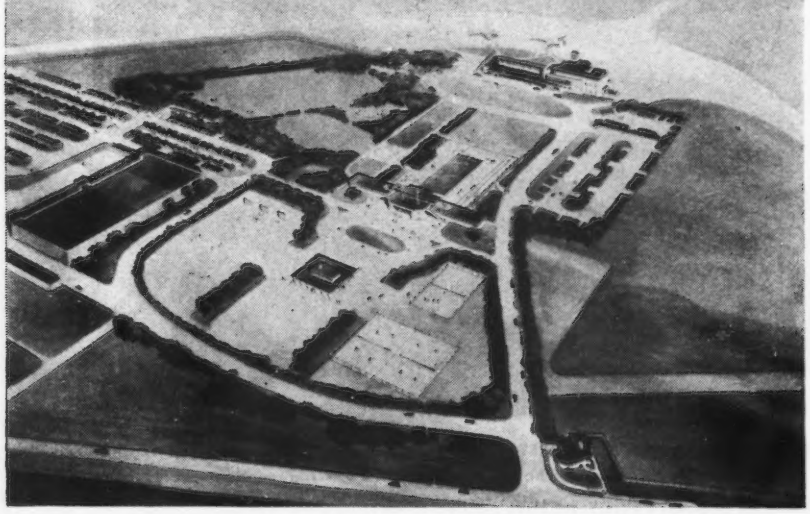
In his address, he indicated testing facilities at the Toledo division, including large dynamometer equipment, will be in operation this summer. He said facilities worth more than $3,000,000 for advanced developmental work and engineering contracts amounting to over $5,000,000 have been awarded Packard for advance research projects. The Toledo division, he said, is devoted one-fourth to research, and three-fourths to production of parts for Rolls-Royce aircraft engines.

The Packard executive's appraisal of future aircraft advancement was one of evolution.

"The advancement of developments such as the gas turbine type in aircraft and the adoption of private flying on a large scale as a means of transportation, will not come as a revolution in this industry," he commented.

"It will be a process of evolution which at the present time is being accelerated by war. It takes time, money and brains, plus a lot of hard work to develop satisfactory products in this field as it does in many other fields."

POSTWAR AIRPORT-CENTER: *Evansville, Ind. has completed plans for a postwar airport of a type which may provide considerably more than prewar requirements of structural materials. The facility is combined with a municipal park which includes tennis courts, picnic tables, swimming and wading pools, ad other recreatonal facilities. Above is shown the entrance to the airport proper and below is the schematic layout. Albert Kahn Associated Architects and Engineers, Inc., Detroit, who did the layout, figure the job can be completed for less than* $2,000,000.



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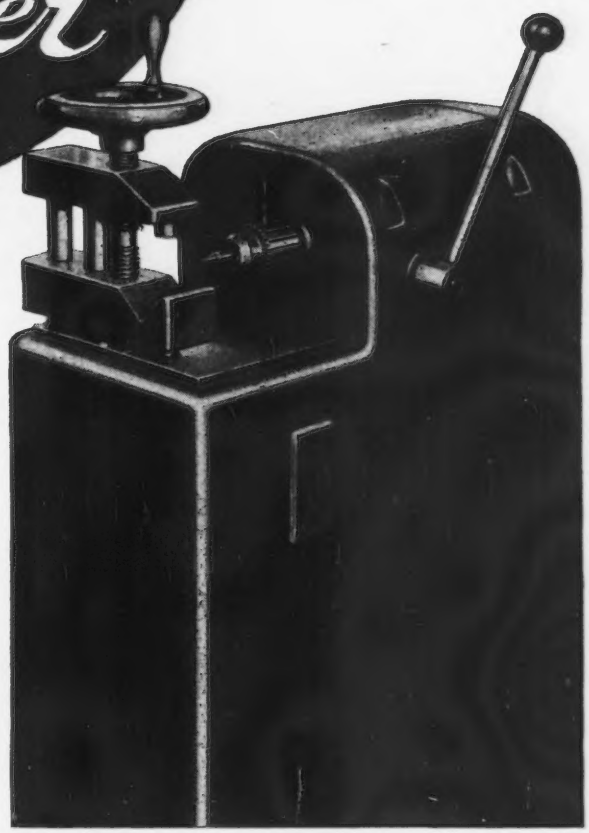

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Washington . . . L. W. MOFFETT

• The Doughton Bill to extend the reciprocal trade act beyond its expiration date on June 12 brings up discussion of the pros and cons of the entire tariff question.

WASHINGTON — The Doughton Bill to extend the reciprocal trade act beyond its expiration date on June 12, provides for a 50 per cent reduction of tariffs in effect on Jan. 1.

Taking into consideration the 50 per cent reduction authorized previously, the State Department, which wrote the bill, says that this means if tariffs have already been reduced by 50 per cent, such tariffs may be reduced a total of 75 per cent. If a tariff has not been reduced at all, it may be reduced by 50 per cent. If a tariff has been reduced less than 50 per cent under the expiring act, then the further 50 per cent reduction will be one-half of the tariff which remains in effect.

Accordingly, this new reduction would operate as follows: (1) If a commodity originally had a $1.50 tariff imposed upon it and the tariff was 75c. on Jan. 1, the President would be authorized to reduce the rate to 37½c. or a total of 75 per cent; (2) if the tariff remained at the original $1.50 on Jan. 1, the President would have authority to reduce the rate to 75c. or 50 per cent; (3) if the tariff was reduced from $1.50 to $1 on Jan. 1, the President would have authority to reduce the rate to 50c., or a total reduction of 66 2/3 per cent.

The tariff question is an old one dating back to the earliest beginning of our government. Arguments for and against the two theories of imposition of tariffs, whether for revenue or protection, are as old as political parties and have been well aired for more than a century and a half.

The great difference at this time is that the administration has announced plans made at Bretton Woods and Mexico City to do away with nationalistic restrictions that are excessive for the elimination of discrimination against foreign corporations and for general economic cooperation. This policy embodied in the reduction of tariffs and the making of reciprocal trade agreements has been called a cornerstone of American foreign policy to be pursued at the peace conferences.

Opposition in Congress has developed largely though not entirely along partisan lines. Republicans generally are against the furtherance of a tariff policy for mere revenue and insist that this legislation "would cause American industry to shut down and thus scuttle any program to provide 60,000,000 jobs when the war is over."

The attempt to get reciprocity in tariffs is no new thing. As early as the tariff act of 1890, Congress gave the President authority to change rates on sugar, hides, molasses, coffee, sugar and hides whenever he deemed other countries imposed customs duties which were "reciprocally unequal."

Political thinking in tariff legislation has not been always uniformly predictable. Republican platforms from 1860 to 1912, with interruptions, stood for a tariff for revenue and protection, while Democratic platforms from 1876 to 1920 spoke of tariffs for revenue only. As early as 1884, the Democratic party conceded, however, that reductions must be gradual. This gradualism was ineffective because the party had neither the unanimity nor the tenure of power to execute it.

Oddly enough, the Democratic platform of 1888 declared that duties should be measured by the difference in wages at home and abroad, preceding by four years the Republicans who did not enunciate this doctrine until 1892.

The Underwood - Simmons "competitive tariff" conception sponsored by President Woodrow Wilson amounted to the same thing substantially as the Republican formula of

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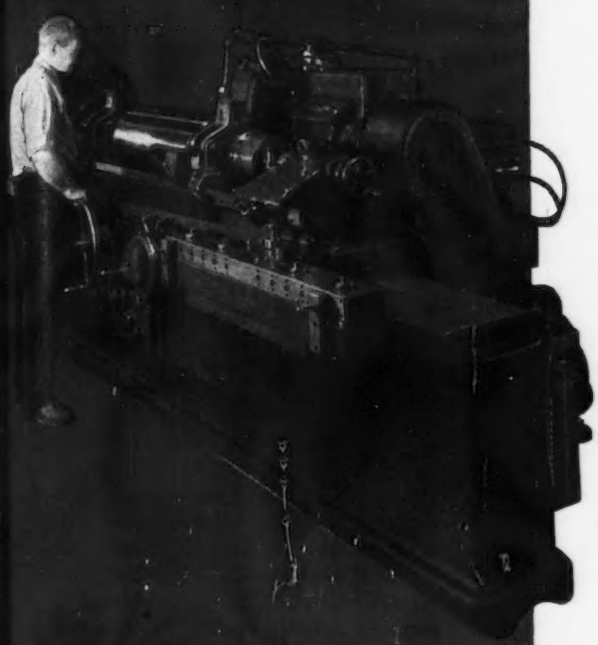
GERMAN CIVILIANS AT WORK: *Paid the same wage scale which they received before American troops arrived, these German civilians work for American Army Engineers breaking and loading rock for road repairs at Pruem, Germany.*



THEY AVE TO BE GOOD

To Crown Aluminum Foil Rolls

Yes, for this job they both have to be good—the machine and the operator. The machine is a CINCINNATI 16″ x 72″ Plain Self-Contained Grinder with swivel table type roll crowning equipment, and the operator is handling an unusually fussy job . . . finish grinding the crown on an aluminum foil roll. This operation requires the ultimate in accuracy and finish to produce foil without wrinkles or blemishes. The surface of the roll must be finished within 4 micro inches and the ends must be the same diameter within .0001″. Any rolling mill operator will tell you what a fussy job this is, and that a machine capable of grinding rolls to such accurate limits has to be good.

Perhaps you have unusually accurate grinding operations where CINCINNATI Grinding Machines, with their exclusive Filmatic bearings, could be used to advantage. Our engineers will be glad to talk it over with you.

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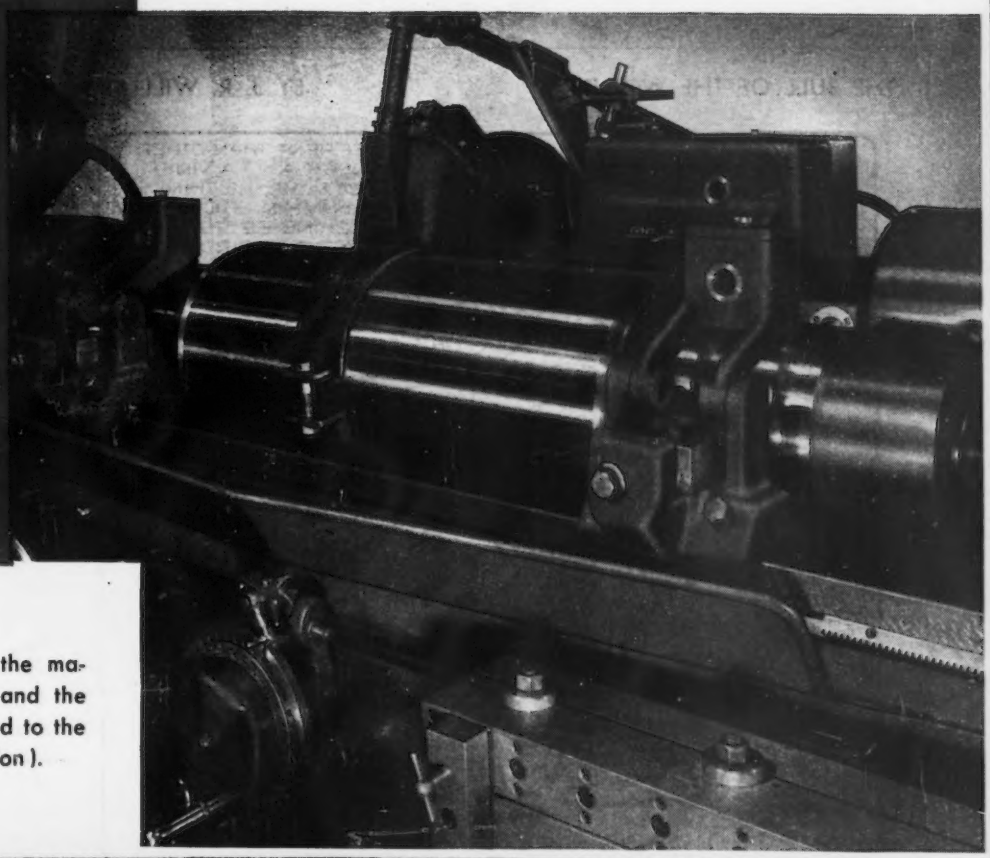

Right—Closeup of the roll in the machine, showing journal rests and the wheel truing attachment clamped to the center of the roll (truing position).

THE CINCINNATI MILLING MACHINE CO. CINCINNATI, 9 OHIO, U.S.A.

TOOL ROOM AND MANUFACTURING MILLING MACHINES . . . SURFACE BROACHING MACHINES . . . CUTTER SHARPENING MACHINES

equalizing costs of production. The Republican platform of 1904 declared that "the measure of protection should always at least equal the difference of cost of production at home and abroad." The platform of 1908 restated this formula but added that "a reasonable profit to American industries" should be taken into account in calculating costs.

The House Ways and Means Committee in its report of the new tariff bill in 1929 adopted "equalization of competitive conditions" as the standard and wrote this standard into the bill as the basis of its flexible provisions.

While it can be seen that the two major parties have favored protective tariffs and occasionally reversed their positions, or adopted the same position, this was true when nothing but purely internal economic concerns governed the thinking. Now that the whole question has been placed by President Roosevelt as a matter of extreme international importance not only to world economic health but to world peace, it will be worth while seeing if traditional party lines are followed.

Already, though, one opponent of the bill is Senator Walter George, Democrat of Georgia, Chairman of the Finance Committee which handles tariff legislation for the Senate. Representative Harold Knutson, Republican of Minnesota, and member of the Ways and Means Committee, which will hold hearings on the proposal April 18-19, has stated his opposition. Representative Woodruff, Republican of Michigan, said he will not only fight the proposal for expanded authority but will seek to kill entirely the pseudo-reciprocal trade policy.

One of the strangest coincidences is that both of the two great labor unions, the AFL and the CIO, recently said that while they subscribed to the principle of reciprocal trade agreements, they would not go on record as being for or against lowered tariffs. The same non-committal attitude was reported by two big trade groups, the United States Chamber of Commerce and the National Association of Manufacturers.

One of the reasons for this, perhaps, is the fact that the State Department has not let labor and industry in on its scheme of a world trading of trade barriers. It has been rumored that if tariffs are further reduced, Great Britain will be willing to see imperial preferences reduced or abandoned, but little or no credence is given to the report. Legislators are pointing out that the British have not shown any disposition toward doing this to their knowledge, but have made it clear that they believe such discriminatory trade rules will be retained.

Otherwise, business and labor thinking, and even that of Congress, is in the dark over the prospects of further tariff reductions, or what industries will be most affected and what gains this country will secure by lowering protective trade walls.

The whole thing was stated in a rather nebulous fashion by the President in his message to Congress on tariffs on March 26. Mr. Roosevelt said:

"We are left in this situation: Great Britain and Canada, our largest peacetime customers, still maintain certain high barriers against our exports, just as we will have high barriers against theirs. Under the act as it now stands, we do not have enough to offer these countries to serve as a basis for the further concessions we want from them."

In continuing explanation of the advantages to be gotten from reduced tariffs, which did not clear up much, he said:

"We must recognize, too, that we are now a creditor country and are destined to be so for some time to come. Unless we make it possible for Americans to buy goods and services widely and readily in the markets of the world, it will be impossible for other countries to pay what is owed us. It is also important to remember that imports mean much more than goods for ultimate consumers. They mean jobs and income at every stage of the distribution channels through which the imports flow to the consumer.

"By reducing our own tariff in conjunction with reduction by other countries of their trade barriers, we create jobs, get more for our money, and improve the standard of living for every American consumer."

While some trade sources point out that reciprocal trade agreements may be all right if this country is protected by anti-dumping legislation, government officials say that the anti-dumping clause in the tariff act of 1930 is still in effect. Trade sources reply that this is true but that the anti-dumping clause not only is cumbersome but is a dead letter because the United States government has never enforced it.

Canada has a most sensible law against dumping. It provides that foreign countries' goods must be sold at a price equal to their domestic price with the addition of transportation. And Canada has enforced the act.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

CAN'T SAVVY THAT! WITH A PALACE OF AN OFFICE NOW, HE GITS SENTIMENTAL OVER TH' DINGY LITTLE OFFICE WHERE HE SPENT MOST OF HIS YOUNG DAYS ON TH' ROAD TO SUCCESS!
HE'S NO DIFF'RENT THAN OTHER PEOPLE, ONLY IT AIN'T A VINE-COVERED COTTAGE--HE THINKS OF GEARS HUMMIN' 'STID OF BEES--MACHINE BELTS SHRIEKIN' 'STID OF BIRDS SINGIN'--TH' SMELL OF FRESH-TURNED STEEL 'STID OF SOIL--TH' HERD OF LATHES SOFTLY MOOIN'--OH, I COULD GO ON!
J.R.WILLIAMS
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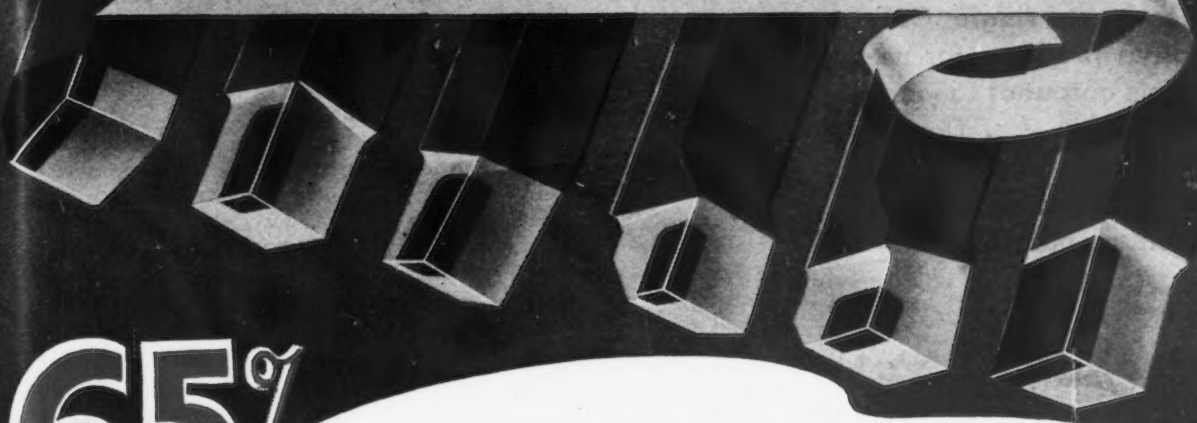

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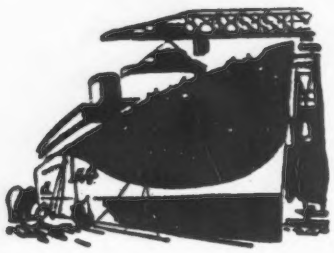
• Army Ordnance depends on single California producer for nation's output of 155 mm. howitzers . . . Donald Douglas declares future of aviation is government responsibility.



SAN FRANCISCO — Metamorphosis of a three lathe machine shop into the sole supplier of Army's 155 mm. howitzers is a wartime development reflecting credit on a pioneer West Coast producer and Army Ordnance alike.

The forgotten Army officer who placed the Yuba Mfg. Co. on the industry conversion program list after the last war may pride himself on his foresight. Exactly why such a small shop as Yuba's should have attracted his attention has been obscured by time. Yuba was established some 35 years ago to make gold dredging equipment for the mining firms with which it is affiliated. From an extremely modest inception, it became the world's largest dredge manufacturers, but could hardly be considered a factor in the precision manufacturing field. Its chief claim to consideration was concentrated in a very capable and versatile engineering staff, as well as in the nucleus of long experienced, expert workmen who could adapt themselves to new manufacturing techniques. Today Yuba has completely taken over from the Watervliet Arsenal in New York the machining and rifling of the tubes, and manufacturing the breech rings and blocks for this basic weapon.

In addition to normal difficulties in conversion to war work, Yuba's problem was complicated by a serious time factor. Initial war preparedness had been directed generally toward defense manufacture. By the time the Army launched its offensive program, production facilities were already congested. Yuba's engineering staff, in addition to having to master an entirely new product and technique; was forced to uncover entirely new sources of supply during a period when such work was comparatively uncoordinated.

Carriage recoil mechanisms and fire control parts were a new technical world to conquer. At the outset, Watervliet was also engaged in the same operations for which Yuba's feverishly expanded facilities were designed—to machine the tubes, block, and ring. Located on tidewater at Benicia, Calif. adjoining a historic Army arsenal, the Yuba plant receives the raw forged tubes from eastern sources, processes them, assembles rings and blocks, and reships them East for final assembly, mounting, and proving.

Originally layed out for the manufacture of heavy equipment, trebling the floor space of the plant was sufficient for the increased production. Equipment has been doubled, trebled, and in some cases has been increased a hundredfold. Among the installations are two lathes received from England on reverse lend-lease from a bombed-out plant.

In addition to receiving the tubes from eastern sources, the breech rings, which had hitherto all been forged, come from an Ohio foundry where they are centrifugally cast.

Indicative of the effect of this type of operation on the industry of this area is the fact that Yuba subcontracts parts from 20 other firms in six different California cities, and one in Indiana. This latter firm, the Steel or Bronze Piston Ring Mfg. Corp. of Indianapolis, was the only company which replied to a request for quotations for split rings. Production difficulties with this item endangered, for a time, the entire howitzer manufacturing program.

YUBA and Army Ordnance credit the subcontractors with an important share in the success of the operation. Plugs and blocks come from Aircraft Tools, Inc. of Los Angeles. American Can Co. at San

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BLUEPRINT CONTAINERS: *Transparent tenite tubing is used as storage containers for aviation tool blueprints. The cylinder keeps prints dust-free, prevents their becoming frayed and torn in storage and provides a compact means of filing.*

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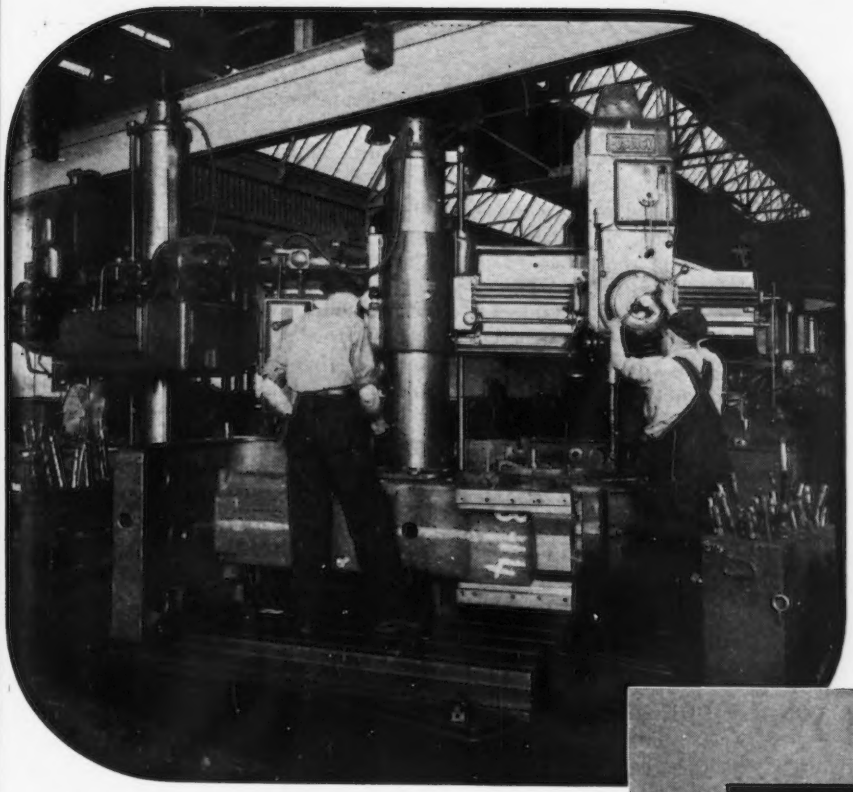

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● The use of two bases with this Fosdick Radial permit drilling and tapping operations on two sides of the work so that production is practically continuous.

Here's how it's done. While one operator sets up the work and locates jigs in operating position the Radial operator drills and taps holes on one side of casting. The head is then swung over the other casting for drilling and tapping the other side of the work. The completed work is removed and another casting is set up in its place. By this time the work on the other base is completed and the operation of setting up is duplicated. Thus operation is practically continuous and production has been increased about 100%.

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FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

Francisco supplies parts for adapter and handle assemblies. Barney Bristow Mfg. Co. makes parts for pivot and carrier assembly. Bay Specialties Co., across the narrow upper bay at Martinez, supplies parts for the crankshaft assembly and other units. The Berkeley Brass Foundry carried out the experimental work necessary for the bushings and heads. E. D. Bullard Co., San Francisco, safety equipment manufacturer, adapted its facilities to turning out parts for the firing mechanism. A small arms manufacturer was found in Sacramento who also went into production on the firing mechanism, hand filling them to required tolerances. One of the interesting aspects of subcontract placing was getting three competitive shops in Sacramento, the Capital Machine & Welding Works, Hansen Machine Works, and the Robert McNairn Machine Works, to overlook past rivalries and cooperate on making a considerable number of the howitzer parts. One of these shops solved a production hurdle by converting a radial drill for use in substantially the same way that a turret lathe would be used.

Steel castings for the carrier, driver, and bracket come from Pacific Steel Casting Co., Berkeley, whose castings are shipped East for assembly and manufacture. Yuba considers these castings superior to those obtainable in the East.

Other precision parts come from Edward E. Conn Saw & Tool Works and Fanger Research & Mfg. Co., both of San Francisco, and from a race track equipment manufacturer, International Totalizer Co. at San Mateo. From further south, Hayward Precision Products Co., Morrow Engineering Co., Inc., and Standardized Aircraft, a subsidiary of the Signal Oil Co., came another important volume of assembly parts. Shand & Jurs Co., Berkeley, rigged a horizontal grinder with a cam action fixture to step up the grinding of firing pins.

Grinding facilities of the Paraffine Co., paint, roofing, and flooring manufacturers, supplement Yuba's facilities.

An important contribution by Yuba's own electrical engineering department was automatic electronic controls on the duplicator and on the Plan-o-mil for the jump thread operation, to cut the cam path on the breechblock, to control surface grinding on the breech rings, a special control used for cutting an integral key as well, and for cutting spindle threads. Each of these controls was either developed by the company or so improved that they could be adapted to the desired purpose.

Officials of Yuba practically all have come up from the ranks. Each executive has been with the organization for a period of 20 to 50 years, which may explain how the organization has achieved its position in the Ordnance program.

Howitzers being what they are, the company has given very little thought to its eventual peacetime future. Contracts for the "Grizzly Bear" continue to run for more than the next year. Unless extraordinary demands from reconquered gold, tin, and platinum fields alter the picture, Yuba will have its hands full for some time to come.

DONALD DOUGLAS declared last week that the future of aviation is the responsibility of the national government, in an address before the Commonwealth Club of San Francisco.

"When the war ends," he said, "the aircraft industry will find itself on peaks it can never hope to occupy permanently. National government cannot say to us and to industry generally, 'from here on it's everyone for himself.' This places an extra responsibility on the government and the American people to see that no unreasonable or unnecessary obstacles are placed in the path of the aircraft industry when it finally gets the green light for the postwar start—to see that the industry is not tangled up with red tape, with long debates, with political witch hunts and accounting inquisitions."

Simultaneously, the California legislature released results of a two-year survey of the aircraft industry. The study foresees an industrial future rivaling that of Detroit.

A questionnaire submitted to 1500 aircraft plants disclosed that 35 per cent say they will have to discharge in excess of 50 per cent of their present personnel; 23 per cent state they will discharge between 25 and 50 per cent, and 27 per cent will discharge no workers. On resumption of normal production 57 per cent will reemploy over 50 per cent of present personnel and 21 per cent will rehire 25 to 50 per cent, the report indicates.

Conversion will take less than 30 days for 46 per cent of the firms reporting, while the remainder estimate that it will take 60 days to a year.

* * *

Rumblings in the ranks of organized labor condemn as an actual decrease a recent pay raise granted by WLB to four plants, and resent a current invasion of the Los Angeles area by the Mechanics Educational Society of America, labelled by established union leaders "a company union." George White, national president of the MESA, says that he is out to organize every plant in the metals industry. "We are going to place our emphasis on organizing shipyards, aircraft plants and tool and die shops." Mr. White plans to make his headquarters in Los Angeles "for as long as it takes to do the job." He also is quoted as having his eye on rubber plants.

Injection of MESA, an independent union, into the unsettled labor future of southern California promises to add to the turbulence attendant to reconversion.

Cited for Awards

• • • **The following companies** have received Army-Navy "E" awards for outstanding war production:

American Foundry Equipment Co., Mishawaka, Ind. (third star)
Wales-Strippit Corp., North Tonawanda, N. Y. (first star)
Glenn L. Martin Co., Baltimore, Md.
Milwaukee Reliance Boiler Works, Milwaukee.
National Fireworks, Inc., Plant No. 11, Mayfield, Ky.
Otis Helium Plant, Bureau of Mines, Otis, Ka.
Peerless Electric Co., Warren, Ohio.
Rival Mfg. Co., Plants No. 1, 2, 3, Kansas City, Mo.
Roxalin Flexible Finishes, Inc., Elizabeth, N. J.
Walsh Construction Co., and **J. Rich Steers, Inc.**, Jersey City, N. J.
Western Wood Products Co., Pallet Division, Fort Smith, Ark.
Westinghouse Electric & Mfg. Co., Radio Division, Sunbury, Pa.
Whitehead & Kales Co., River Rouge, Mich.
V. F. Zahodiakin Engineering Corp., Summit, N. J.
Aerial Products, Inc., Merrick, N. Y.
Arapahoe Mfg. Co., Englewood, Colo.
Besler Corp., Emeryville, Calif.
Bison Castings, Inc., Buffalo, N. Y.
David Bogen Co., Inc., New York.
Bromfield Mfg. Co., Inc., East Boston, Mass.
Clayton & Lambert Mfg. Co., Detroit.
Cuffman Lumber Co., Arkadelphia Box Co., plant, Arkadelphia, Ark.
Eaton Metal Products Corp., Albuquerque, N. M.
Executone, Inc., New York.
Gulfport Boiler & Welding Works, Port Arthur, Tex.
Hertner Electric Co., Cleveland.
Johnson Machine Works, Chariton, Iowa.
Kearney Pattern Works & Foundry, San Jose, Calif.
Walter Kidde & Co., Inc., Belleville, N. J.
Kinetic Mfg. Co., Cleveland.
Letts Drop Forge, Inc., Detroit.
McCormick Brothers Co., Albany, Ind.
Marmon-Herrington Co., Indianapolis.
J. A. Zurn Mfg. Co., Erie, Pa.

IT'LL BE A BRIGHT DAY FOR STAINLESS TOO

When ten million veterans come marching home, many of them will know a lot about the advantages of stainless steel. They'll be "sold" on the merits of this bright rustless metal.

One reason is that the Services give their men the best for eating equipment. ARMCO Stainless Steel is used in mess equipment because it is so easy to keep clean and sterile. Possessing great strength, it can be fabricated into light-weight utensils, so important on a march. And this hard rustless steel is highly resistant to denting, scratching and corrosive conditions.

These advantages of ARMCO Stainless can add distinction and durability to many peacetime products—make them more salable and therefore more profitable. Consider it for your products. Let us talk with your designers so they will have complete information on the various types of ARMCO Stainless Steels and their qualities.

For data on these steels address The American Rolling Mill Co., 1021 Curtis Street, Middletown, Ohio.

EXPORT: THE ARMCO INTERNATIONAL CORPORATION

The American Rolling Mill Company

PERSONALS

o o o

G. D. THOMPSON, president, Pittsburgh Steel Foundry Corp.

• **G. D. Thompson,** chairman of the board of directors, Pittsburgh Steel Foundry Corp., Glassport, Pa., has been elected president of the company. A member of the firm's board of directors for the past six years, Mr. Thompson became chairman in 1942. He was at one time connected with Westinghouse as a production manager.

• **C. P. Pesek** has been appointed administrator of engineering, Minnesota Mining & Mfg. Co., St. Paul. **W. A. Thomas,** formerly assistant chief engineer, has been made engineering consultant on Mr. Pesek's staff.

• **C. A. Nichols,** formerly superintendent, Order Department, Coatesville, Pa., plant of Bethlehem Steel Co. has retired. Mr. Nichol has been connected with the steel industry for 41 years.

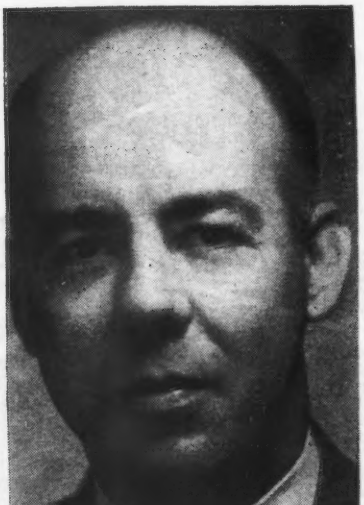
• **A. S. Woodard** has been named assistant chief engineer of the Pennsylvania Salt Mfg. Co., Philadelphia.

• **R. D. Parsons** has returned, after an absence of over three years, to his former position of sales representative, Chicago district office, ACF-Brill Motors Co., New York.

• **William F. Stamets** has been appointed sales engineer for the Special Products Division, Lodge & Shipley Machine Tool Co., Cincinnati.

• **Milton Strauss,** who recently purchased the Boss Bolt & Nut Co., Chicago, has been elected president and treasurer of the firm. **George S. Hubbard** has been elected vice-president; **C. J. Johnson** has been re-elected secretary and named assistant treasurer and **Edward J. Guck** has been named general manager in charge of production.

• **Frank J. Karg** has been elected president of the Herman Machine & Tool Co., Tallmadge, Ohio, to succeed **Leo Herman,** who has become chairman of the board. **Anthony G. Bachman** has been elected treasurer.



WARD R. SCHAFER, vice-president, in charge of sales, Edison General Electric Appliance Co.

• **Ward R. Schafer** has been elected vice-president in charge of sales, Edison General Electric Appliance Co., Chicago. Mr. Schafer joined the company as an engineer in 1923 and has since served as manager of product service, manager of the range division and manager of the western sales region.

• **Alfred B. Egan** has been named Chicago district manager, Sheffield Steel Corp., Kansas City, Mo.

• **Marcel C. Boss** has been named chief engineer in charge of design and production operations of the Optimus Equipment Co., Matawan, N. J.

• **Frank P. Rhame** has been elected president and general manager of the Lunkenheimer Co., Cincinnati; **Homer E. Lunken** has been named first vice-president and assistant general manager; **Harry A. Burdorf,** vice-president, sales; **Charles W. Burrage,** secretary; **Chester C. Isekeit,** treasurer and controller.

• **Eric C. Gyllensvard,** of the Farrel-Birmingham Co., Inc., Ansonia, Conn., has been appointed export sales manager, with headquarters in New York City. Mr. Gyllensvard previously served as export manager of the Sullivan Machinery Co., Michigan City, Ind.

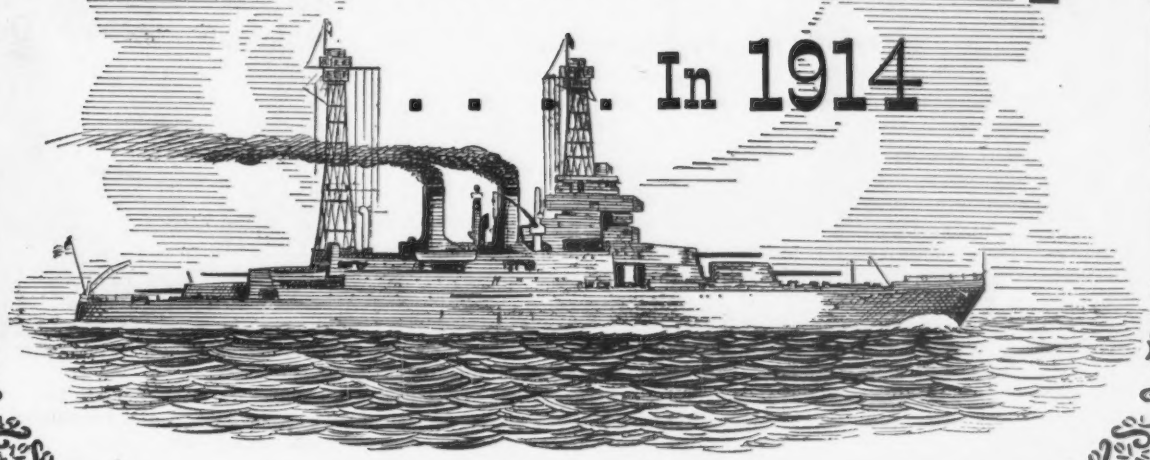
• **Roland D. Doane** has been named general sales manager, Ingersoll Steel & Disc Division, Borg-Warner Corp., Chicago. **Thurlo F. Johnson** has been appointed national service manager of the Norge Division.

• **E. P. Jones,** formerly development engineer of The Linde Air Products Co., has resigned to join the Pressure Weld Co., Houston, as general superintendent.

• **Robert G. Allen** has been appointed general manager, Baldwin Southwark Division, The Baldwin Locomotive Works, Eddystone, Pa. Mr. Allen formerly was president of the Duff-Norton Mfg. Co., Pittsburgh, a position he held until July, 1942, when he was granted a leave of absence to accept a commission in the Army.

ROBERT G. ALLEN, general manager, Baldwin Southwark Division, The Baldwin Locomotive Works.

She Was A Good Battleship . . . . In 1914



CRANE BUILDING *has advanced too*

Queen of the fleet in 1914, it was the best that naval engineering could produce. But it can't compete today with swift modern war greyhounds. Improvement has overtaken it. While it is still seaworthy, it is too slow and unwieldy for modern battle.

Cranes have improved too. Those old cranes you may have may be perfectly sound—almost as good as the day you bought them. But they are too slow and unwieldy to keep up with the production speed of the rest of your equipment.

You can increase your plant production—reduce handling costs, by replacing them with new Northern Cranes. These are faster, more powerful, stronger, have finer control, require much less attention.

MODERN NORTHERN CRANES SPEED PRODUCTION

Faster material handling in greater volume increases production of your whole plant—quickly pays the cost of new Northern Cranes.

Write for details on Northern Cranes—Northern Super-Cranes—Northern Hi-Lift (Low Headroom) Cranes.

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The fine machine tool of overhead cranes built for heavy duty, 24-hour-a-day jobs.

NORTHERN SUPER-CRANE

GORDON GAGE, manager, Butler, Pa., division, The American Rolling Mill Co.

• **Gordon Gage,** former general superintendent, has been appointed manager of the Butler, Pa., division, The American Rolling Mill Co., Middletown, Ohio, succeeding **Harry Holiday,** who has resigned because of illness. **Roy P. Tooke,** assistant chief of the general engineering department in Middletown, has been transferred to Butler to succeed Mr. Gage as general superintendent.

• **James Low** has been made industrial relations and personnel director of the Cogswell Mfg. Co., West Springfield, Mass.

• **Gordon N. Gray** has been appointed works manager of the St. Clair plant, Bryant Heater Co., Cleveland.

• **Henry S. Lewis** has joined the Manning Welding & Engineering Co., Inc., Newark, N. J., as a partner of the firm.

• **A. D. Mellor,** founder and sole owner of Ferro-Co Corp., Brooklyn, N. Y., has retired.

• **F. S. Cockburn** has been reappointed field representative in Peru for the Allis-Chalmers Mfg. Co., Milwaukee. Mr. Cockburn acted as the company's representative in Peru for a number of years prior to the outbreak of the war.

• **Raymond P. Lansing** has been elected a director of Bendix Aviation Corp., Detroit.

• **Arthur P. Hammerstrom** has been named apparatus and supplies manager, Central District, Westinghouse Electric Supply Co., New York. **Mr. Hammerstrom** succeeds **H. E. Bracke,** who has been transferred to the Cincinnati office.

• **C. M. Bovard** has been named design engineer and **Ralph H. Schlosser,** chief draftsman of The Cooper-Bessemer Corp., Mount Vernon, Ohio.

• **George Ericson** has been appointed head of the patent department for the American Car & Foundry Co., New York, and its subsidiaries.

FRANK R. WRIGHT, district manager, New England territory. Rustless Iron & Steel Corp.

• **Frank R. Wright,** formerly district manager in charge of the Buffalo office of the Rustless Iron & Steel Corp., Baltimore, has been appointed district manager for the New England territory, with headquarters in Boston.

• **E. J. Flood** has been appointed general district sales manager for the Chicago sales territories of American Chain & Cable Co., Inc., Bridgeport, Conn. Mr. Flood has been connected with the Page Steel and Wire, and American Chain Divisions of the company for 25 years.

...OBITUARY...

• **George T. Horton,** 71, president of Chicago Bridge & Iron Co., died suddenly March 19. Mr. Horton had been with the company for over 50 years.

• **Louis Schultz,** 68, founder of the Sunlite Mfg. Co., Milwaukee, and treasurer of the A. B. Zuckert Co., died March 16.

• **Peter Hott,** 85, head of the Milwaukee Iron Works, and former superintendent of the Filer & Stowell Co., Milwaukee, died March 18.

• **Joseph F. Shepherd,** manager of the Service Engineering Department of The Sheffield Corp., Dayton, Ohio, died suddenly March 18. Mr. Shepherd had been with the firm for 22 years.

• **Jay J. Burgin,** 32, owner of the Amherst Machine & Tool Works, Williamsville, N. Y., died March 23.

• **John P. Maison,** 65, chief inspector for the American Radiator & Standard Sanitary Corp., Buffalo, N. Y., died March 23.

• **Leverette L. Putnam,** 47, factory representative for the Youngstown Pressed Steel Corp., at Endicott, N. Y., died March 24.

• **Thomas H. Cleveland,** for the past eight years assistant credit manager of the Inland Steel Co., Chicago, died March 22 at the age of 49.

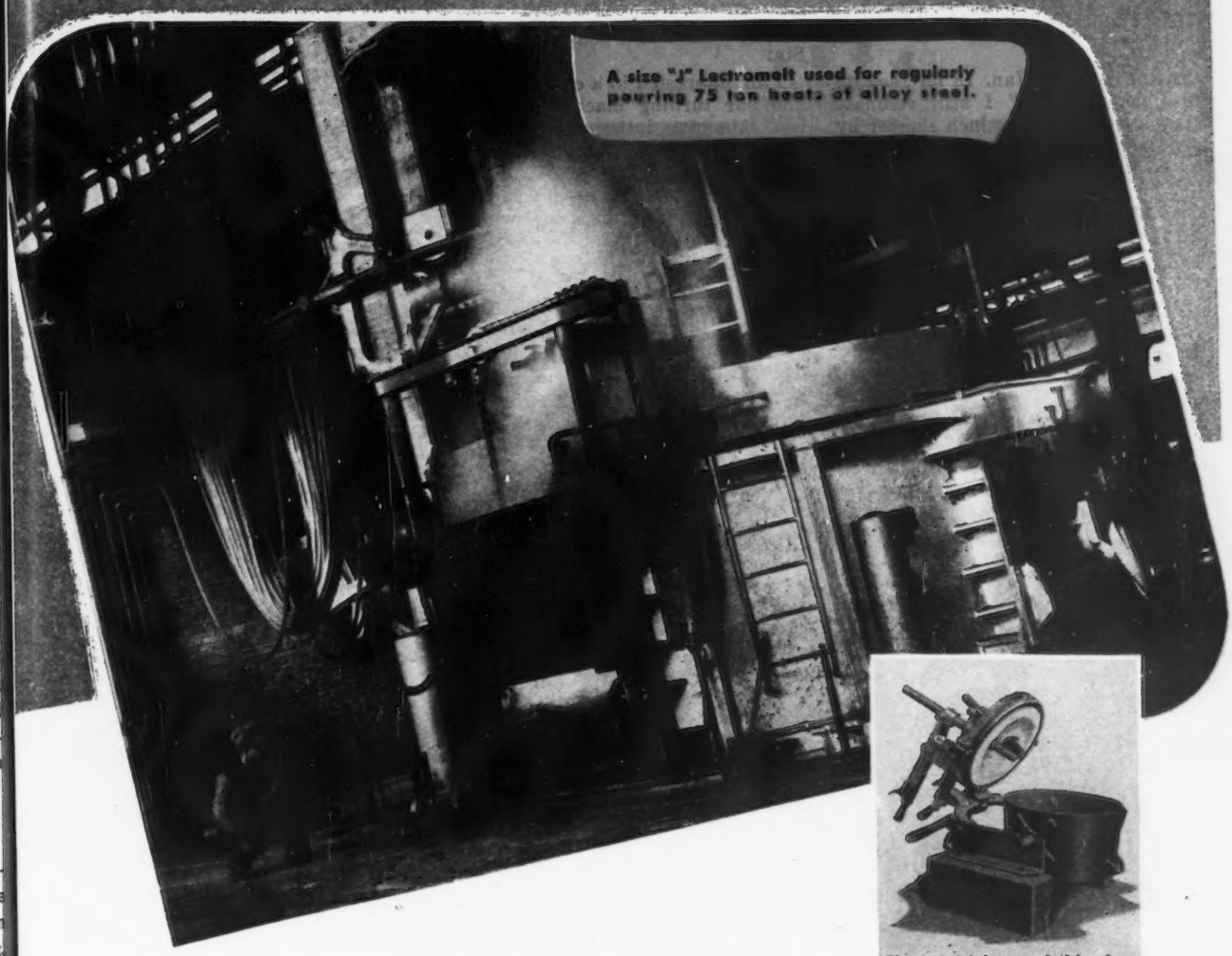
• **George H. Wright,** a recognized authority in the development of uses for new metals and a contributor to the manufacture and adoption of high-speed cutting steels since he joined the Works Laboratory of General Electric Co., Schenectady, in 1902, died March 26.

• **Alfred F. Jackson,** president of Aeronautical Products Corp., Detroit, died March 21 from injuries incurred in a plane crash March 21.

• **Donald N. Mussen,** 46, head of sales and research engineering for the Trico Products Corp., Buffalo, N. Y., died March 21.

• **Herbert R. Allen,** New York district manager of the Square D Co., Detroit, died March 14.

MOORE RAPID *Lectromelt* FURNACES



A size "J" Lectromelt used for regularly pouring 75 ton heats of alloy steel.

The usual heat of this size "X" laboratory Lectromelt furnace is 20-30 pounds.

. . . . in Capacities To Meet Your Requirements

MOORE Rapid Lectromelt Furnaces are available in a wide range of capacities, designed to meet every requirement in electric melting of quality steels and irons.

Varying in size from installations which can pour 100 tons of electric furnace steel per heat to laboratory models pouring 25 pound heats, Lectromelt furnaces will increase production and lower operating costs. They are available in both door and top-charge types.

CONSULT LECTROMELT FOR COMPLETE DETAILS WITHOUT OBLIGATION.

PITTSBURGH LECTROMELT FURNACE CORPORATION

PITTSBURGH, . . 30 . . PENNA.

Dear Editor:

STET

Sir:

In the issue of Jan. 18 on reading "Millimeter Mixup" I still resonate dreaming on a speedy inch shorter by one 64th of an inertian inch, I mean one inch of 25 millimeters. Then came a pound heavier by 46 gr. and 1999 equal others making a Ton neither short nor long but right of 1000 Kg.

When each 100 of those pounds laid on one sq. in. it was net 8 kg per sq. cm. Each foot-pound of my work was precisely felt as .15 kgm. and the energy spent, since the HP was no more 550 but 500 ft. lb. per sec., appeared reasonably at the rate of 75 kg.m per sec per HP. Each cu.ft was then precisely 27 liters and 6 rounded British gallons filled it. That time I begun feeling bad on Fahrenheit but soon this disappeared and each pound-centigrade heat unit made .5 kilocalories per BTU. I went awake really reluctant.

Now, I believe the system above has some interest because everybody could use inches or ordinary fractions of it for common work and millimeters or decimal fractions of it for precision or skilled work. At Paris late as 1932 I bought apples a pound of half a kg, so you see.

F. FABRIANI
Laranjeiras, 350—Rio-Brazil

FATIGUE CRACKS

Sir:

What's happened to Fatigue Cracks? Not that the remainder of the contents of THE IRON AGE isn't up to the usual standard, but one likes to live in "lighter vein" once in a while. The touch of genius seemed ever hovering over the shoulder of that particular department.

H. H. INGRAM
Eastman Kodak Co.,
343 State St., Rochester 4

● Like you, we believe that the value of The Iron Age was greatly enhanced by the lighter vein of this editorial feature. Arthur H. Dix, its author, left The Iron Age at the beginning of the year to take charge of the departments of Reader Service and Research for the Conover-Mast Corp., New York.—Ed.

CERAMIC BURNERS

Sir:

I am interested in the "all ceramic gas burners" mentioned in News Front in the March 6 issue. Can you give me the name of the manufacturer?

CARL ROEHRI
Federal Die Casting Co.,
2222 Elston Ave., Chicago 14

● These ceramic burners are made by the Selas Co. of America, Philadelphia 34.—Ed.

CENTERLESS LATHE

Sir:

I am interested in a centerless shaft and bar turning machine or centerless skimming lathe used mainly by steel works producing bar material to be machined on turret lathes, automatics, etc. If manufactured in this country, please inform me who are the manufacturers.

ARNOLD S. ROSTAN
315 E. 68th St., New York 21

● Such a machine is made by the Medart Co., St. Louis 18. It operates as a hollow mill and is different in principle from centerless grinders.—Ed.

CAST TOOL STEELS

Sir:

I have read with interest the article by J. Albin in the March 1 issue on precision casting of high speed steel tools. We have precision cast a number of tools in our laboratory, but have since abandoned the project. I believe you have presented an over-optimistic view.

We encountered no difficulty in casting the desired shapes and sizes within tolerances, but the proper structure could not be obtained. The as-cast structure of high speed steel consists of austenite grains surrounded by the eutectic. During solidification, the first solid to form contains low percentages of carbon and alloying elements, so that as freezing progresses, the liquid becomes enriched in both carbon and alloy content until the remaining liquid reacts at the eutectic temperature and deposits austenite and carbide simultaneously. Obviously, very marked coring exists and before any use can be made of the alloy, it must be forged or rolled to break up the carbide network. Heat treatment alone will not refine the structure. For this reason it seems very doubtful that high speed tool steels will be fabricated by the precision casting technique. Furthermore, I believe any application in which a precision cast tool might serve satisfactorily would be more effectively handled by Carboloy.

E. EPREMIAN,
Research Laboratory
General Electric Co.,
Schenectady

● An article published in the Sept. 24, 1942, issue, "Casting High Speed Steel," describes sand and centrifugal casting methods employed at the Gorham Tool Co., Detroit. According to the article high speed steels cast in rough tool shapes are easily and economically finished and will operate at much higher speeds than forged tools, and under difficult conditions. However, we have no specific data on performance results with precision cast cutting tools at the Ford Motor Co.—Ed.

FILLING MICRO-PORES

Sir:

Metals and Alloys has kindly suggested that you have published articles on the impregnation of castings to reduce effects of micro-porosity. We are keenly interested in information on this subject.

BRETT D. HOLMES,
President
Light Metals Corp.,
Grand Rapids, Mich.

● Articles in The Iron Age include "Magnesium Castings Impregnated," Aug. 5, 1943; "Magnesium Impregnated by New Method," Nov. 11, 1943, and "Drying Impregnated Castings," Dec. 9, 1943. Sorry but we cannot supply tear sheets of these articles. The Bakelite Division of Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, has a bulletin on impregnation of castings with Bakelite.—Ed.

POSTWAR EXPORTS

Sir:

Will you kindly forward to us a copy of the completed survey which you recently conducted on the postwar export market.

GEORGE REINDEL, JR.,
Motor Sales Manager
Holtzer-Cabot Electric Co.,
400 Stuart St., Boston

● This article appeared in the issue of Jan. 4. Tear sheets have been mailed.—Ed.

GALVANIZING KETTLE

Sir:

In the article on "Production Galvanizing of Ammunition Cases," from the March 8 issue, a device is mentioned designed by the Hamilton Mfg. Co. for use in putting cases through a zinc kettle. There are several companies by this name throughout the country and we wish you would advise us which one makes it.

ALLEN S. PEARL,
Secretary
Delta-Star Electric Co.,
Chicago 12

Sir:

As manufacturers of hot dipped metalware, we were much interested in the excellent article on galvanizing in the March 8 issue. We would like additional information on the automatic feeders, such as where they are in use, on what type of products, speed, economy, etc., and would appreciate the address of Hamilton Mfg. Co. or other suppliers of this type of equipment.

H. A. SHERER,
Chief Engineer
Reeves Steel & Mfg. Co.,
Dover, Ohio

● The Hamilton Mfg. Co. may be addressed at Two Rivers, Wis.—Ed.

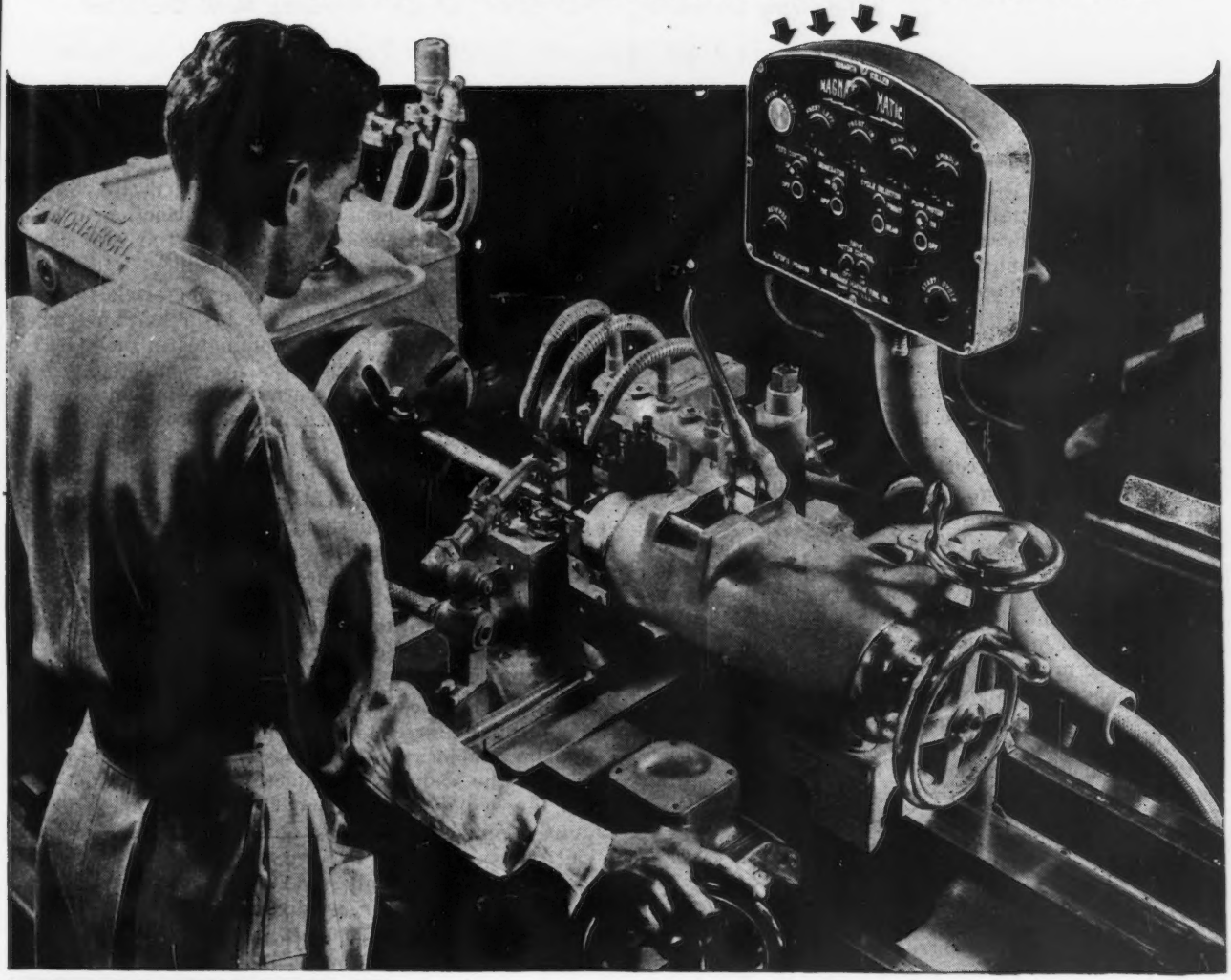
IMPACT RESISTANCE

Sir:

Please send us one copy of "Impact Resistance vs. Hardness of Aircraft Low Alloy Steels" by John M. Thompson, Jr., published in the March 8 issue.

A. S. JAMESON,
Works Metallurgist
International Harvester Co.,
Chicago 1

JUST A TWIST OF THE WRIST CONTROLS THE MONARCH MAGNAMATIC



Monarch Saves Time

Controls on the Monarch Magnamatic are concentrated within arm's length for fast setup and easy operation of this modern double carriage, all-electrically controlled turning machine.

Handwheels with micrometer adjustments permit quick setups for economical turning even of short runs. Start-cycle button on panel controls the operating cycle. Electric controls permit automatic selection of six different feed rates for maximum metal removal or for different finishes on various portions of the work.

The Monarch Magnamatic has 10 years of successful performance on peace and war work. Marked advancement in electrical controls has permitted us to improve even its previous satisfactory operation.

For automatic or semiautomatic operation on short or long runs, the Monarch Magnamatic will more than pay its way by reducing costs on a wide variety of turning, boring or facing work. Ask for detailed information.

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Representatives in principal cities.

512 Empire Bldg., Pittsburgh 22, Pa.
38th and College Ave., Indianapolis, Ind.

This Industrial Week . .

- **Feeling Growing That Steel Order Volume Will Decline**
- **For First Time in Months District Trends Are Not Uniform**
- **Plans for Further Steel Price Adjustments Seen Hitting Snag**

ORDER volume in the steel industry this week was still relatively heavy with some steel companies continuing to report an excess in orders over shipments. Throughout the trade, however, there was this week a definite feeling that the March peak in war orders—perhaps the highest monthly volume in steel history—was beginning to change its shape into a plateau, poised for sharp descent when military cutbacks become numerous after Germany collapses.

For the first time in many months steel ordering trends were not uniform in all districts. This is partly accounted for by the nature of the steel orders which predominate in certain areas or certain companies. In the Chicago district fresh steel business continued to roll in at a high volume, but cancellations were beginning to appear as a result of the cut in second quarter allotments. The bulk of these adjustments, however, is yet to come even though the second quarter has begun.

At Pittsburgh, the flow of orders has eased somewhat, but one mill reports that its bookings were still somewhat ahead of shipments. Cancellations at Pittsburgh are on the upgrade, the result being that monthly carryovers have improved, although they still represent a definite production problem.

Probably indicative of events to come, even before Germany collapses, was the cutback this week in the shell program involving a contract at a plant of the Jones & Laughlin Steel Corp. Construction work on a 105 mm. shell line was suspended and the contract for 1,000,000 105 mm. smoke shells was cancelled. The Navy cutback on ship construction last week was reflected in rather substantial openings on plate mill schedules.

It is believed that the armed services are actively studying the feasibility of going forward with those cancellations which would not necessarily have to wait until the final blow at Germany succeeds. While there was still some confusion in many official circles this week as to what magnitude the cutbacks would be on VE-Day and as to the speed with which they would be put into operation, general belief was that the Army would take a gradual course in order to mitigate a possible chaotic steel order and production condition in the industry. Nevertheless, there are many who feel just as strongly that cutbacks will reach the mills with such an impact after VE-Day that confusion will, at least temporarily, be the order of the day.

STEEL backlogs were still exceptionally heavy this past week and there was little to indicate that anything but a small dent would be made in them, until military cutbacks made their appearance in much greater volume. Much of this unfilled tonnage, however, will probably never be shipped, as many of the delivery promises on some of these products are extended as far as the fourth quarter of this year and the first quarter of next year. Despite the prospect for heavy inroads being made in steel order volume and backlogs after VE-Day, any decline in the entry of new business and in the production of steel will be due to the necessity for readjusting mill schedules rather than due to lack of demand.

Demand will be heavy for war materials to carry the Pacific fight to a conclusion. Furthermore, when some semblance of order predominates in the steel industry after VE-Day cutbacks are completed, a new flow of steel orders for permissible civilian use will begin to take up the slack in steel production.

ON representative steel products, delivery promises being quoted currently are about the same as promises given a month ago. There were some extensions on such items as alloy steel, strip mill sheets, hot rolled strip, hot rolled pickled sheets, and cold finished bars. The greatest extension in deliveries involves electric furnace alloy bars, with one large producer promising February, 1946, delivery, compared to August promises at the beginning of March.

Plate producers are currently interested in a new gas pipeline project to run from Oklahoma to Detroit, a distance of nearly 1300 miles. Because of the tightness in the seamless tube picture, it is expected that the line will be made from welded pipe and will require about 250,000 tons of steel. Plans presently call for construction to begin May 1. The order will consist of about 65 miles of 20 in., 300 miles of 22 in., and 900 miles of 26 in. welded pipe.

The expected steel price adjustment by OPA on steel products in addition to those announced on Jan. 11, seemed early this week to have struck a snag. Steel sources had expected that new price adjustments would probably be permitted by at least April 1. Further conferences on the problem may be necessary and it is hinted in Washington circles that final action by OPA on steel price adjustments may be held in abeyance until after VE-Day. However, on the basis of past history definite conclusions as to what OPA will or will not do, or if they will do it, or when they will do it, must remain purely within the realms of speculation.

It is reported that 875 railroad cars have been authorized and scheduled for construction by WPB this past week. Kansas City Southern has awarded 150 70-ton hopper cars to Pullman Standard and 50 70-ton covered hopper cars also to Pullman. General American Transportation has orders for 50 70-ton covered hoppers from Haliburton Oil Well & Cementing Co., 15 50-ton covered hoppers from Carbon Chemical Corp., and 10 milk refrigerator cars for its own lines. Trustees for Chicago & Alton Railroad have received court authorization to purchase 500 50-ton all steel box cars from Pullman Standard. Recent inquiries include 20 50-ton box cars for Reynolds Metals Co. and 250 50-ton box cars for Consolidated Railroad of Cuba.

• **WHEN THE WAR ENDS**—There is not too much reconversion to be brought about in steel mills when the war ends. Wide strip mills which have handled plates are again in heavy sheet production. Sheet output on these mills has increased recently due to the drop in plate load. However, main worry in the steel industry is "how long will it take before cutbacks will be reflected in steel order cancellations." Mills will be apprehensive about all orders on the books, not knowing which will be eliminated. Many cancellations will affect orders in mill backlogs while others may seriously disrupt steel mill schedules which have already been set up. It is this latter probability which might cause an unprecedented move on the part of some companies and force some steel units to suspend operations until confusion has been eliminated. Long nights in steel schedule departments and in order divisions will be necessary to properly cancel orders and replace them in steel mill schedules out in the plants. Fast action by WPB and the armed forces will be necessary if the steel industry is not to be temporarily crippled in getting out war steel needed for the Pacific War.

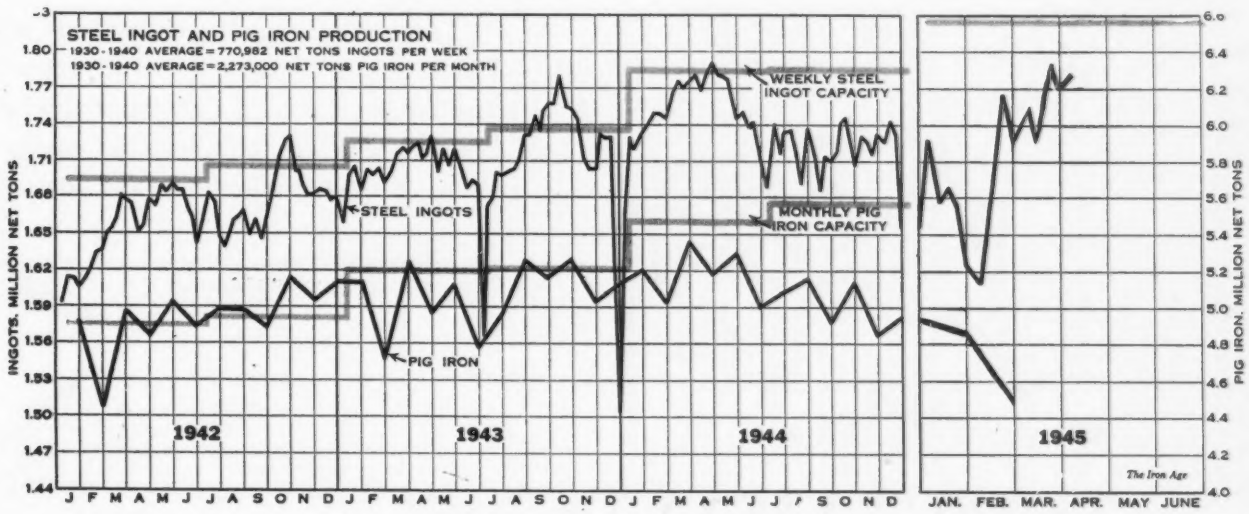
• **WARM WEATHER PROBLEMS**—Unseasonally warm weather recently has again brought home to steel production officials the fact that output will suffer again this year. In recent years the drop in production due to hot-weather fatigue has not been as great as had been expected. Part of this condition has been due to close watch and preventive measures against heat exhaustion. There was a time when summer meant severe cramp cases with some fatalities. This state of affairs has, however, practically disappeared in the past several years. Nevertheless, the fact that steelworkers in the open hearth and at soaking pits have been working abnormally long hours, may mean as much as a three to four per cent drop in output, if weather conditions reach unusual temperatures. WPB will again, as it did last year, take cognizance of this condition when making out third quarter steel allotments and directives.

• **GREAT LAKES SHIPPING OPENS**—The Office of Defense Transportation announced last week that two ships of Canadian registry passed through the Straits of Sault Ste. Marie on March 25 enroute to Fort William, Ontario, thus officially opening the 1945 Great Lakes shipping season. March 25 is a relatively early date for the opening of Great Lakes navigation, according to Lawrence C. Turner, head of ODT's Waterways Transport Department. Last year's season did not open until April 10. The opening date for 1943 was April 25; that of 1942, March 26.

• **BLAST FURNACE PREDICTION**—"In the not too distant future, we may be using almost pure oxygen for blast furnace operation, and catalytic combustion methods may be applied in other fields of steel industry combustion," was a prediction made recently in a paper entitled, ***Modern Steel Mill Technique*** by Martin J. Conway, manager, Petroleum Division, Lukens Steel Co., Coatesville, Pa., given before a meeting of the Metropolitan Section of the American Society of Mechanical Engineers. The application of these new methods may improve operations and aid in reducing fuel costs in the future, the speaker said, pointing out that while the steel industry has an enormous fuel bill, it has "decreased per ton of basic product at the rate of approximately one per cent per year for the past 20 years."

•**COLUMBIUM BOOKLET**—A technical booklet on pure columbium metal, possibly the first of its kind, has been prepared by Fansteel Metallurgical Corp., North Chicago, Ill., which in 1929 was the first producer of the pure metal. Only recently has columbium been prepared on a production basis. Its present use is in electronic tube components. Columbium carbide has important uses in steel cutting cemented carbide tools.

• **TURKISH DEMANDS UNSATISFIED**—A Turkish purchasing mission which recently visited the United States to place orders for machinery and equipment was able to place orders amounting only to $5,000,000 or $6,000,000, according to Talhu Sabuncu, Turkish Commercial Counselor. The mission had been prepared to place orders for several times that amount. A new mission, which is headed for the United States, has placed approximately 75 per cent of its potential commitments in Great Britain, according to unconfirmed reports received by Mr. Sabuncu.


STEEL INGOT AND PIG IRON PRODUCTION
1930-1940 AVERAGE = 770,982 NET TONS INGOTS PER WEEK
1930-1940 AVERAGE = 2,273,000 NET TONS PIG IRON PER MONTH
WEEKLY STEEL INGOT CAPACITY
STEEL INGOTS
MONTHLY PIG IRON CAPACITY
PIG IRON
INGOTS, MILLION NET TONS
PIG IRON, MILLION NET TONS
1942
1943
1944
1945
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
JAN. FEB. MAR. APR. MAY JUNE
The Iron Age

Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
March 27	93.0	103.0	92.0	97.0	94.0	104.0*	92.0	99.0	101.0	91.5	90.0	94.5	94.0	96.5
April 3	92.5	102.0	91.5	97.0	98.0	104.5	90.0	99.0	100.5	91.5	90.0	94.5	97.5	96.0

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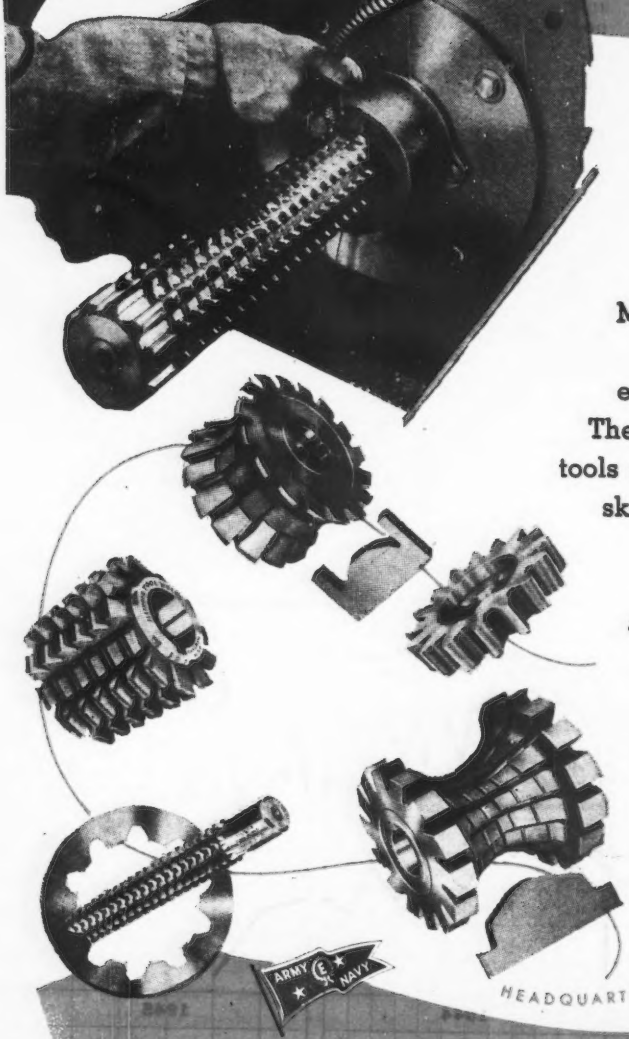

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Byrnes Report Describes Nature of VE-Day Cutbacks

Washington

By DON BROWNE

o o o

• • • **Reconversion was still at the crystal ball stage two days after the Byrnes report on this subject was made to Congress on April 1.**

WPB officials could not say how much civilian production would be possible 90 days after the official designation of VE-Day, because: 1—Official confusion over how much the overall military cutback would be despite the fact that Mr. Byrnes announced that it would be a 15 or 20 per cent cancellation of War Department contracts in the first quarter after VE-Day, 30 per cent in nine months and 40 per cent within one year after VE-Day. 2—The War Department has not submitted final cutback figures. 3—The feeling that cutbacks would be greater than semi-official estimates which vary.

A general outline of what WPB expects to do when VE-Day arrives with no definite dates of when each part of the program takes effect follows: 1—Streamline the spot authorization plan. 2—Permit the mills to operate under an "open end" OMP wherein civilian orders could be filled beyond firm allotments. 3—Programming certain essential civilian items such as work gloves, shoes, children's clothing. 4—Suspend rating floors, that is, remove the necessity for purchasers to have a minimum rating to purchase certain goods. 5—Start suspending "L" and "M" orders, particularly those affecting hard goods. 6—Elimination of conservation restrictions requiring substitutions.

To illustrate the present confusion: A spokesman for Mr. Byrnes said that it is planned to have a 10 per cent overall cutback in the first quarter after VE-Day; a source close to WPB Chairman J. A. Krug said that the overall cutback of military end items would be 10 per cent in the first quarter, but that an additional 10 per cent would be made because of "de-pipelining" or adjusting inventories; an official report purporting to reflect the present official view of OWMR says that the first quarter overall cutback is 10 per cent in 30 days, 18 per cent within the second quarter, and 33 per cent at the end of the third quarter after VE-Day.

Still another official supposed to know what is happening says it will occur in this fashion: A 12 per cent cutback in the first quarter, which will expand to 20 per cent because of "de-pipelining" and the second quarter will work out to be an additional 15 per cent because of further "de-pipelining" and cutbacks at a higher rate than has been admitted by the Byrnes report.

While the Byrnes report says that only 1,000,000 persons will be temporarily unemployed within one year after VE-Day and stresses the orderliness of the reconversion process, a prominent steel figure here predicts a crazy sag in steel mill operations immediately following the declaration of VE-Day.

This executive predicted that there will be an overnight cancellation of orders of such a drastic nature that mill output will be reduced to a minimum; that mills will not dare to make any shipments very early after VE-Day because of the cancellation prospect, but would be forced to roll rails and such items as tin-mill coils for stock. He said that he could not hazard a guess of how long this condition would prevail, whether a few days, weeks, or for as long as several months.

If an overall cutback of 10 per cent is made in the first quarter, only about 800,000 tons of capacity will be available for other than military production; if it is 20 per cent, there will only be a release of about 1,490,000 tons of steel for civilians.

Mr. Byrnes said that VE-Day "will provide no immediate relief in either truck or passenger car transportation." However, the report said that upon review of facilities by the War Department and cancellation of orders for machine tools, it may be possible to get added tools for the automobile industry in the fall.

The Report states that Economic Stabilizer William H. Davis and OPA Administrator Chester Bowles have developed a program which is designed to keep prices in check and consumer buying power under control; hold wages in check and at the same time establish prices on newly manufactured goods so as to facilitate reconversion.

Mr. Byrnes said that he has asked that a special study be made to determine those industries in which hourly wage rates have increased somewhat less than the cost of living, and hence any sharp decline in hours worked per week would lower the standard of living. The purpose of the study is to determine the adjustments which can be made on those industries in the framework of stabilization policies.

"Other than in such instances we must wait until we know how much of our war productivity has been carried over into peacetime production before wage rates can be increased," the war mobilizer asserted. He further said that take-home pay in peace time equal to take-home pay now being received, must have as a foundation a volume of production and consumption of civilian goods equal to our present production.

Small business is to be permitted to convert more quickly, or should be able to, and WPB is told to see to it that small concerns are given adequate access to materials.

On the question of how much production should be permitted to re-equip troops to move war operations from Europe to the Pacific, Mr. Brynes said:

"The significant change in this

Byrnes Resigns OWMR

Washington

• • • The resignation of War Mobilizer James F. Byrnes, announced on April 2, when his report on reconversion was formally submitted to Congress, confirmed reports that he was going to leave government service as soon as he had completed the report. The selection by the President of Federal Loan Administrator Fred M. Vinson to succeed Justice Byrnes also had been anticipated.

Mr. Byrnes, former senator and former member of the Supreme Court, in his letter of resignation told the President that to all intents and purposes victory has been won in Europe so far as his job was concerned and that his successor should take up the work of reconversion now.

Mr. Vinson, former economic stabilizer, was made Federal Loan Administrator only recently and had hardly familiarized himself with that office until he was made head of the OWMR.

Army supply program over the VE-Day program prepared last fall lies in a substantial increase in the acceptance of deliveries of munitions in the three months following the defeat of Germany. The reasons for this are obvious.

"Since the time the original program was computed, large tonnages of equipment have been moved to Europe. Men can be moved to the Pacific faster than materials. The Equipment in Europe must be repackaged and recrated for shipment to the Pacific. While all usable equipment is counted as an asset for operations, several months will be required to fill the pipeline from Europe to the Pacific. Plans have been made for this operation. While it is being placed in effect, deliveries must be accepted in the United States to meet the demands in the Pacific. When the pipeline begins to flow, the deliveries within the United States will be reduced rapidly.

Aviation Turbine Division Is Formed by Westinghouse for Jet Engines

Philadelphia

• • • **The first jet propulsion** engine in this country free from foreign influence to be tested in flight is under development at Westinghouse Mfg. & Electric Co., at Philadelphia and Pittsburgh for the Bureau of Aeronautics, Navy Department. According to "Army Ordnance" it is expected that the new engine will produce more pounds of thrust for a given amount of fuel and pounds of weight than any of the engines brought from Europe for study.

Westinghouse, according to an announcement this week, has formed an Aviation Gas Turbine Division for the manufacture of military, and, later, commercial gas turbine aircraft engines, based on the jet engine developed by the company for the Navy, The work being done is in three fields. One is in the field of high temperature metallurgy, because the success of the gas turbine is dependent upon the temperatures in the turbine itself, being from 1200 deg. F. and upward. The higher the allowable temperatures, the greater is the efficiency and wider is the field of usefulness of the gas turbine as a prime mover.

The second field is that of design. This includes designs for the three main components of the engine — axial flow compressor, combustor, and gas turbine, and the relatively few but important controls and auxiliaries.

The third activity is the investigation of uses of the combustion gas-turbine cycle. This involves extensive thermodynamic and heat balance calculations for open cycle systems, heat recovery open cycle systems, and closed cycle systems, all predicated on assumed efficiencies, loadings, and costs.

Efficiency of the 1200 deg F. simple open cycle turbine plant is about 20 per cent, which is only about two-thirds that of a good steam or gasoline engine. Efficiency can be increased 10 or 15 per cent by adding heat recovery devices.

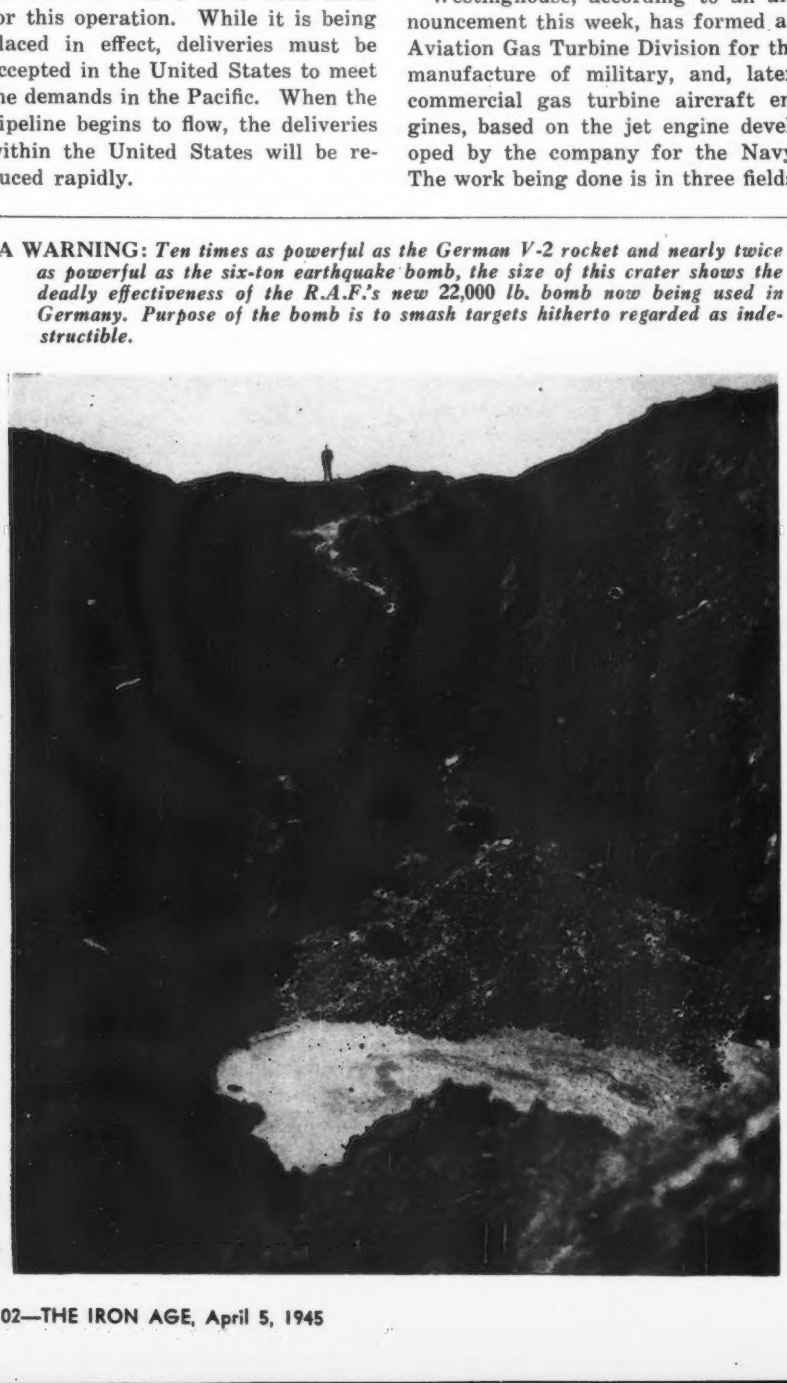
According to L. E. Osborne, vice-president of Westinghoue, in discussing the Westinghouse background in this field, he said: "Through the initial development stage, we have utilized the facilities of the Steam Division here to the fullest. These resources have been acquired over the past half-century of development of the steam turbine, both as a generator of electrical power and as motive power for ships.

The new jet engine, prototype of commercial versions to follow, is the result of research and design studies in company laboratories here and in Pittsburgh which began Dec. 8, 1941.

Use of such compact, mechanically simple engines for aircraft drive — particularly in the realm of military and other high-performance operations — promises to establish new standards of streamlined design, speed and rate of climb for aircraft which are now in the development stage, according to the company.

The gas turbine, when its propulsive power is applied through the simple 'reaction jet,' has the enormous mechanical advantage of having only one moving part. A typical internal combustion engine of compa-

A WARNING: *Ten times as powerful as the German V-2 rocket and nearly twice as powerful as the six-ton earthquake bomb, the size of this crater shows the deadly effectiveness of the R.A.F.'s new 22,000 lb. bomb now being used in Germany. Purpose of the bomb is to smash targets hitherto regarded as indestructible.*



rable power has hundreds of moving parts, all of which must move in carefully-adjusted relation to each other, requiring very precise timing, and involving complex problems of vibration and lubrication.

In its present form as developed by Westinghouse, the jet propulsion gas turbine in a straight line producer of power. All four of its major components—compressor, combustor, turbine and jet nozzle—are lined up one behind the other in that order, so that power is not lost in changing the direction of flow of the column of air that roars through the turbine.

Manager of the new Westinghouse manufacturing division, which will have its headquarters at the South Philadelphia Works here, is George H. Woodard, formerly manager of the company's New Products Division at East Pittsburgh, Pa.

Westinghouse has been carrying on the research and development work which led to the design of this "Yankee" engine since 1939, and the first military unit—a jet propulsion version of the gas turbine engine—was flown more than a year ago, Mr. Woodard said.

He continued, our engineers—and engineers in the aircraft industry generally—feel that the upper limits of aircraft performance using conventional reciprocating engines is very near at hand. The Aviation Gas Turbine Division will press development work on various models of turbine aircraft engines.

Very high-performance military operations, and regular commercial schedules at speeds considerably above current levels, will depend on use of such new forms of motive power as jet propulsion and combinations of jet power and propeller drive, utilizing the inherent high speed advantages of gas turbines.

Reinout P. Kroon, who as manager of development engineering in the Steam Division headed a staff of engineers instrumental in the design of the new jet engine, has been named manager of the Engineering Department.

Britton Resigns SPB

Washington

• • • **Mason Britton,** administrator for the Surplus Property Board, has resigned, effective April 1. In announcing his resignation, Board Chairman Guy M. Gillette said that Mr. Britton is leaving to undertake an important confidential assignment for which he was recently drafted.

Cancellations on Navy Vessels To Affect Deliveries in Next Two Years

Washington

• • • **The cancellation of** a whole fleet of 72 Navy combatant ships announced March 27 by the Navy Department, will save an estimated $1,500,000,000 and more than 500,000 tons of steel. Of the original program of 84 ships, only 12 10,000-ton escort carriers will be completed under present plans. The ships canceled are eight aircraft carriers, 10 cruisers, 36 destroyers and 18 submarines. The immediate effect of the cancellations on steel shipments has been only slight because the contracts for the ships call for deliveries up to 1947 and most of the steel would have been shipped late this year and up to the middle of 1946.

Secretary of the Navy James Forrestal later said that War Mobilizer James F. Byrnes had ordered the cut and not the Navy. Mr. Forrestal emphasized that he was neither criticising nor affirming the judgment of Mr. Byrnes in cancelling the program.

"Somebody has to weigh competing demands on the economy," he conceded, "but we do not dilute our opinion in accepting that judgment."

The Secretary said the Navy may ask to have parts of the canceled program resumed at a later date. The program was planned to insure quick replacement of possible losses.

The canceled ships would have required between 516,000 and 590,000 tons of structural steel and plates other than heavy armor plate. This would have been approximately 180,000 to 201,000 tons of structural steel, and 336,000 to 375,000 tons of plates for delivery in the third and fourth quarters of this year.

It is estimated that 45,000 men would have had to have been assigned to the ships if they had been built.

The table below details the cancellations.

The Kaiser Vancouver yard will construct eight of the escort carriers still to be completed, while four escort carriers will be built by the Todd Shipbuilding Co., Tacoma, Wash.

SHIP CLASS	NUMBER	TONNAGE	COMPANY OR YARD
Aircraft Carrier	2	45,000	Newport News Shipbuilding Co., Newport News, Va.
Aircraft Carrier	2	27,000	Navy Yard, Brooklyn
Aircraft Carrier	1	27,000	Navy Yard, Philadelphia
Aircraft Carrier	2	27,000	Navy Yard, Norfolk, Va.
Aircraft Carrier	1	27,000	Bethlehem Steel Co., Fore River Yard, Quincy, Mass.
Heavy Cruisers	4	10,000 to 13,000	New York Shipbuilding Corp., Camden, N. J.
Destroyer	11	2200	Bath Iron Works, Bath, Maine
Destroyer	4	2200	Navy Yard, Boston
Destroyer	8	2200	Bethlehem Steel Co., Staten Island, N. Y.
Destroyer	10	2200	Consolidated Steel, Ltd. Orange, Texas
Destroyer	3	2200	Navy Yard, Charleston, S. C.
Submarine	3	1500	Navy Yard, Portsmouth
Submarine	3	1500	Electric Boat Co., Groton, Conn.
Submarine	12	1500	Not contracted for
Light Cruiser	6	Unknown	Not contracted for
	72	636,000 Estimate	

Cleveland Automatic Profits Drop in '44

Cleveland

• • • **Cleveland Automatic** Machine Co. reports 1944 net profits of $184,753 after provision of $100,000 for wartime and postwar adjustments, compared with $283,868 earned in 1943.

Shipments were maintained at substantially the 1943 level by the manufacture of items other than the regular line, including fork-type lift trucks, transmission assemblies for industries trucks, shell-turning lathes, gun mount assemblies and screw machine products, according to president Harold R. Le Blond.

The company has written off the unearned surplus amounting to $219,417, representing appreciation over cost based on an appraisal made in 1922.

Labor-Management Charter Is Submitted to Public for Its Approval

Washington

• • • Sponsored by the Chamber of Commerce of the United States, AFL and CIO, a seven-point management-labor code of principles looking to postwar high production, full employment and prosperity under a private competitive system was announced on March 28 at a joint press conference of the three organizations. The proposal was warmly endorsed by President Roosevelt and in Congress.

Presiding as acting chairman was Eric Johnston, president of the Chamber. Sitting beside him were AFL President William Green and CIO President Philip Murray. Also present were E. L. Thomas, president of the Goodyear Tire & Rubber Co., Akron, Ohio, and Otto Seyferth, president of the West Michigan Foundry Co., Muskegon, Mich. Mr. Thomas is a member of a national committee of 15 to 20 members of whom a dozen have been chosen. The committee will develop a mechanism to implement the management-labor charter to be submitted to participating organizations. Mr. Seyferth is chairman of the Chamber's Labor Relations Committee. Mr. Johnston said that the charter is a beginning, at least, "to solving some of our problems between management and labor in the postwar world."

The charter outlines a framework of increased prosperity at wages assuring a steadily advancing standard of living; improved technological advancement; the rights of private property; free competition; the right and responsibility of management to direct the operation of an enterprise; a reasonable profit; freedom from unnecessary governmental interference; the right of labor to organize and to bargain collectively with management, free from legislative enactments that interfere with the objectives of peacefully settling differences and thereby discouraging strife through strikes and lock-outs; building an economic system that will protect the individual against the hazards of unemployment, old age and physical impairment; an expanding economy at home that will be stimulated by a vastly increased foreign trade by affording the devastated or undeveloped nations reasonable assistance to encourage their rebuilding and development on a sound economic basis; banning subsidized competition and elimination of arbitrary or unreasonable practices and international trade; establishment of an enduring peace through an international security organization, with full participation by all the United Nations, capable of preventing aggression and assuring lasting peace.

Members of the national committee chosen so far are:

For labor—Mr. Green, Mr. Murray, George Meany, Robert Watt, R. J. Thomas, Sidney Hillman.

For management — Mr. Seyferth, Mr. Thomas, Paul Hoffman, president of the Studebaker Corp.; Henry Kaiser, president of Henry J. Kaiser & Co.; David Zellerbach, president of the Crown-Zellerbach Corp., San Francisco; Mr. Johnston.

In opening the conference Mr. Johnston said that there are two roads that can be traveled after this war. One, he pointed out, leads to a high degree of industrial peace and the other to chaos. With this in mind, he explained, representatives of management and labor, choosing the former road, have for some time been endeavoring to write a charter for the postwar world.

Replying to a question Mr. Johnston said that the National Association of Manufacturers sat in on one of the meetings and has been invited to two others.

Later, however, he said that, of course, the committee will consider consumer representatives. Reply also was made by Mr. Thomas who said that there is one thing "which all of us in business and labor must never forget and that is we all have one boss, and that is the consuming public and any time we fail to take that into recognition we would be headed for trouble." He proposed that that be one of the guiding principles that govern the action of the national committee.

Mr. Murray, in supplementing remarks by Mr. Johnston, said that the plan for management-labor unity does not constitute a collusive agreement designed to operate against the interest of any group of citizens anywhere in the United States. Each one, he said, giving due recognition to his obligations as a leader in his own field and to his country, subscribed wholeheartedly to the code of principles.

While the plan as developed is an understanding among the Chamber, AFL and CIO, Mr. Murray said, the proposal is being submitted through them to the people of the United States for their approval.

Mr. Green said that through acceptance of the principles of the code, the area of controversy within the field of human relations in industry has been reduced and the field of agreement and understanding has been increased.

The code is not perfect, Mr. Green said, and will not eliminate strikes

NAM Calls Charter Premature

New York

• • • The seven point labor-management program announced recently is good as far as it goes, but is nowhere near specific enough, Ira Mosher, president of the NAM, said recently.

In support of this view, Mr. Mosher made public a letter written by him to Mr. Johnston on March 9, in which he said:

"The proposed statement of principles is premature. To obtain wide acceptance, such a statement should be the result of deliberations by a larger and more representative group. Such a group could give consideration as to how the purposes of the statement might be implemented before issuance, which would lend great strength to the words. Otherwise, instead of promoting unity between labor and management, a statement couched in such general terms could easily breed further misunderstanding between them and really not materially assist in formulating sound public policies."

Commenting further, Mr. Mosher stated, "If we're going to prevent strife in the rapidly approaching postwar period, management and labor are going to have to get down to cases. The seven principles that make up the so-called charter are generalities on which there is already wide agreement. What the people of America want to know is what is going to be done about making them work. This is a job for the Congress, with labor and management furnishing all the practical help that is within their power."

altogether, "but we can reduce them, we can substitute arbitration and cooperation and understanding and friendly relationship for the strife and bitterness and discord that has characterized industry from the beginning."

Mr. Johnston was asked whether it was "reasonable to suppose" that the committee will take a formal position on things like an annual wage.

"I don't know that," Mr. Johnston replied. "That again, is up to the committee, the President, as you know, has appointed a group to consider the annual wage and to make a report to him, and on that committee are representatives of management, agriculture, labor and government."

A PEACE FEELER: *Here are the principal actors in a serious move which could possibly result in a cooperative attitude on the part of labor and management in the postwar era, when important labor problems must be faced. The "peace charter" may be a forerunner of a more detailed and comprehensive meeting of the minds. Left to right, William Green, AFL president; Eric Johnston, president, U. S. Chamber of Commerce; and Philip Murray, CIO head.*

Smoke Shell Contract Ordered Cancelled at J. & L. Keystone Works

Pittsburgh

• • • While denied by Army officials in this area the cancellation of the contract for the construction of the plant at Jones & Laughlin Steel Corp.'s Keystone works for production of about 1,000,000 105 mm. smoke shells may likely be the first straw in the wind in the cutting back of last December's shell program. Originally, the plant was supposed to go into production of 105 mm. high explosive shells in June, but later the contract was changed, calling for smoke shells. Now, effective April 2, the entire program has been washed up and the building contractor, the Rust Engineering Co., has suspended operations. Machinery in the plant will be disposed of, according to the cancellation terms, but it is believed that there is little in the way of shell production machinery that has been installed in the plant.

It is expected by informed observers here that April will really tell the story in the shell program. By the end of the month, definite needs will be established and the attitude of the past several months of taking all it could get will be overhauled by the Army. The December shell program was definitely designed as one of oversupply. Being caught short once, during the Rundstedt break through, the Army has leaned over backward since that time in order that it would never get caught again. Consequently, shell orders were placed with rather gleeful abandon, shell steel directives rose to the unprecedented height of 1,500,000 tons for the second quarter, and plants producing shells sweated out one of the worst periods in trying to obtain enough help to meet production schedules.

Now, there appears to be a trend toward the reckoning of actual needs against supply, and, undoubtedly, supply is the greater right now. The chances are that by the last week in April there will begin some rather heavy cutbacks in shell production, bringing it more in line with needs.

Blast Furnace Capacity and Production—Net Tons

Source: American Iron & Steel Institute

	Number of Companies	Annual Blast Furnace Capacity	PRODUCTION							
			PIG IRON		FERRO-MANGANESE AND SPIEGEL		TOTAL			
									Per Cent of Capacity	
			February	Year to Date	February	Year to Date	February	Year to Date	February	Year to Date
DISTRIBUTION BY DISTRICTS:										
Eastern	12	12,988,970	778,146	1,609,495	26,130	50,944	804,276	1,660,439	80.7	79.1
Pittsburgh-Youngstown	15	25,904,240	1,829,765	3,810,016	17,213	36,470	1,846,978	3,846,486	92.9	91.8
Cleveland-Detroit	7	6,589,500	454,448	930,624			454,448	930,624	89.9	87.4
Chicago	7	14,070,510	981,594	2,060,538			981,594	2,060,538	90.9	90.6
Southern	8	4,924,670	311,520	660,189	12,519	25,854	324,039	686,043	85.8	86.2
Western	4	2,836,000	151,409	323,632			151,409	323,632	69.6	70.6
TOTAL	37	67,313,890	4,506,882	9,394,494	55,862	113,268	4,562,744	9,507,762	88.4	87.4

PIG IRON SUPPLIES: *Output of pig iron not including ferro-manganese and spiegel declined in February to* 4,506,882, *compared, with* 4,887,612 *tons in January. On a per cent of capacity basis, blast furnace output of both pig iron and ferro-manganese and spiegel amounted to* 88.4 *per cent in February, compared with* 86.5 *per cent in January.*

Ohio Overtime Law Limits Hours For Women and Minors

Cleveland

• • • **A controversy in** the Ohio legislature recently made it necessary for war plants throughout the state to violate the law in order to continue their production schedules. Special legislation, in the form of the Ross Act, authorizing plants to work women and minors 18 or older more than 45 hr. a week expired last weekend.

A bill to extend this legislation two years is deadlocked, and the legislature will be unable to untangle the stalemate before next week. The measure has been passed by both the house and senate, but the house refused to approve an emergency clause making the bill effective immediately. Without the emergency tag, 90 days must elapse before the extender legislation can become effective. The senate deleted a house amendment prohibiting girls of 16 and 17 working after 10 p. m. The present law allows them to work until 11.

This left employers of women in the position of operating under peacetime employment laws until the middle of the week, and these laws fix a maximum of 45 hr. a week for factories and 48 for mercantile establishments.

The Ross Act, which the legislation in dispute would extend, raises the maximum for non-war industries to 50 hr. a week and allows war plants unlimited hours to meet government production requirements.

Unless some action is taken on the Ross Act quickly, war production will be upset in most of Cleveland's war plants and others throughout the state. Here, armament production in Cuyahoga County (which includes Cleveland) will be cut "not less than 15 per cent," if it is necessary to limit working hours for women to 45 a week, John C. Virdin, regional director of the War Production Board, said in a telegram to Gov. Frank J. Lausche.

Mr. Virdin's estimate was made on the basis of a check of the hours of employment of 54,000 males and 34,000 females in 30 war plants here, providing an equitable cross-section of the time workers are spending each week on munitions production.

At Cleveland Graphite Bronze Co. more than 1100 women are working 48 to 55 hr. a week, and according to James L. Fuller, personnel manager, if women were allowed to work only 45 hr., it would completely upset their schedules in every department. "However, we are going ahead as we have been doing. We can work four days next week without breaking the law, maybe by that time something will have been done about it."

"We're going ahead on present schedules; we've had no official notice of the change," Ben Kozman, assistant to the personnel director at Thompson Aircraft Products, Inc., said. At TAPCO about 1300 women are working, and many of them 48 hr. a week. "Unless the Ross Act is enacted, it will cut our production in all departments," Mr. Kozman said.

"No changes in our schedules have been suggested yet," a spokesman for Jack & Heintz, Inc., said. "Meantime nobody is worrying about it. About 3000 women at Jack & Heintz are working 84 hr. a week."

At the same time, war plants and facilitating services, employing 9500 women in Mahoning County and 24,500 in the Youngstown labor market from Ravenna arsenal to Sharron, are faced with the prospect of maintaining production schedules and violating state law or obeying the law and cutting output.

Tank Hulls Subcontracted

Detroit

• • • **A new order** for Army tank hulls totaling approximately $13,000,000 has been received by the Graham-Paige subsidiary in Ohio, the Warren City Manufacturing Company.

The steel hulls to be fabricated for the International Harvester Company will be produced on specially constructed conveyor lines similar to those used in automobile assembly and each unit will be x-ray inspected. Deliveries will begin in June.

COMING EVENTS

April 4-6—SAE National Aeronautic Meeting, New York.

April 12-14—Electrochemical Society, Inc., Philadelphia—Atlantic City Congress, Atlantic City, N. J.

CANCELLED

April—American Zinc Institute, St. Louis.

April 26-27—Annual Conference, Open-Hearth Steel Committee and Blast Furnace and Raw Materials Committee, Iron and Steel Division, AIME, Chicago.

April 30—May 4—American Foundrymen's Association, Detroit.

May 21-22 — American Steel Warehouse Association, 1945 Convention, New York.

May—American Gear Manufacturers Association, general meeting.

May—General Meeting, American Iron & Steel Institute, New York.

Industry and Services Must Keep Up Liaison After the War Ends

New York

• • • **Liaison between industry** and the armed forces must continue closely after the war, "so that American industry shall ever be ready to set in motion quickly, if needed, its vast powers of mass production for war with minimum changes in plant and machinery," it was stated in the annual report of General Motors Corp.

The report showed war products were produced by the company last year having value of $3,843,892,000, bringing total war product values since the start of the arms program to nearly $10 billion. The 1944 dollar total was three per cent over comparable 1943 deliveries. The average number of employees on payrolls last year was 465,617, against 448,848 in 1943, and wages rose in about similar proportion to $1,380,032,467.

In a section dealing with postwar anticipations, the company said that prewar suppliers are being advised in advance wherever practicable so they can plan on peacetime orders as soon as war conditions permit. This section of the report predicted that "it seems likely that at least temporarily after the period of reconversion is completed, there will be a period of intense business activity as compared with prewar standards."

Tool Engineers Group Elects New Officers

Detroit

• • • **At the recent meeting** of the board of directors of the American Society of Tool Engineers, the following officers were elected: President, C. V. Briner, manager of Gage & Tool Division, Pipe Machinery Co., Cleveland; first vice-president, A. M. Sargent, president and general manager of Pioneer Engineering & Mfg. Co., Detroit; second vice-president, W. B. Peirce, vice-president of research and development, Flannery Bolt Co., Bridgeville, Pa.; third vice-president, Thomas P. Orchard, partner and general manager of American Tool Engineering Co., New York; secretary, A. M. Schmit, general manager of A. M. Schmit Co., Toledo; treasurer, W. J. Frederick, president of Frederick Steel Co., Cincinnati; assistant secretary and treasurer, W. A. Dawson, chief inspector of Otis-Fensom Elevator Co., Ltd., Hamilton, Ontario.

Wage Scales Barring Labor Shifts by WMC

Buffalo

• • • **The WMC's program** in the Niagara frontier area to force male workers from non-essential industries into "must" war plants has yielded only 20 men in three weeks of operation due to wage differentials, according to Joseph D. Canty, WMC area director. During that time, 1107 employees were interviewed.

While results so far have been disappointing, Mr. Canty insisted that "the situation is not hopeless." He said that 36 additional cases are pending and "any number obtained is a help. We are receiving the finest cooperation from workers and employers."

Mr. Canty said that 116 men referred by non-essential industries were found suitable for war work, 870 were returned to their non-essential jobs, 23 balked at war jobs and were refused referrals elsewhere, and 98 are in an uncertain category pending physical examinations or the results of military examinations.

Two principal reasons offered for the program's failure to produce more men for the hard-pressed "must" war plants are the lack of physical qualifications and the impracticability of shifting skilled workmen from $1.50 per hr. jobs to unskilled laboring jobs paying about 80c. an hr.

Warehouses to Be Built for Display And Surplus Sales

Dayton, Ohio

• • • **Bids will be** opened April 9, at the Reconstruction Finance Corp.'s disposing loan agency in Cleveland for the construction of warehouses in Dayton, which will be one of a number of display and disposal for government-owned capital and producers goods, it was learned here recently.

One of 60 located in 30 cities over the country, the center here will be the first to be built in Ohio and the third in the nation. Two others are now located at New York and Detroit.

Anticipations are that the new disposal center will have 285,000 sq. ft. of temporary warehouse space; 160,000 sq. ft. in prefabricated warehouses, and 320,000 sq. ft. of open storage space. Cost of the center is indefinite, but on the basis of previous construction, it is estimated at about $2 a sq. ft. At that rate, the cost would be approximately $1,500,000.

Construction will be started as soon as possible after the contracts have been let, probably within a week, and while location of the site is not definite, it has been reported that the center will be situated in the vicinity of Moraine City.

This storage space will be used primarily to expedite the transfer of production equipment from one type of war production into another, and for later use as a storage and disposing center for many types of production equipment no longer needed for war production.

Need for storage space arises when war contracts are completed and machinery now in use is moved from plants, and when different types of equipment are installed to manufacture new types of munitions. Some of the equipment will be available for use in the manufacture of essential civilian goods.

RFC officials described the warehouses as follows: Temporary closed storage buildings have a life expectancy of from seven to ten years, while the prefabricated types, which may or may not be roofed, are suitable for later use as garages.

Concrete Piercing Fuze Important In Blowing Pillboxes

Pittsburgh

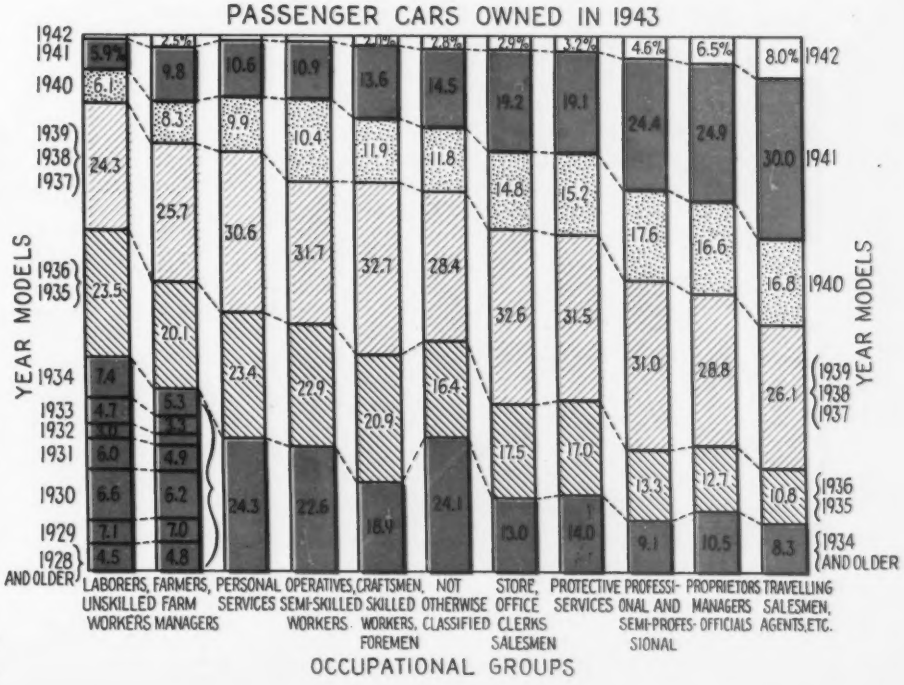
• • • **American artillery** pounding the Eastern Rhineland and Jap fortified positions in the Philippines are using a new concrete-piercing fuze. The new fuze can be screwed on the nose of every artillery shell from a 75 mm gun shell to a massive 240 mm howitzer shell.

Inside the pointed metal fuze is placed a sensitive high explosive which sets off a booster mechanism containing a slightly less sensitive explosive. The booster, in turn, sets off the explosive in the shell.

The new fuze is strong enough to permit the shell to pierce certain types of pillboxes or other concrete fortifications before the explosion occurs. It is also sufficiently accurate to permit a fraction of a second's delay before the shell, embedded in the concrete, blows a section of thick concrete into a million pieces.

Artillerymen have the satisfaction of knowing that some concrete fortifications that had formerly been invulnerable to light and even heavy artillery are now crumbling under direct hits from this concrete- piercing fuze.

CAR OWNERSHIP: ***Farmers and unskilled workers own the highest proportion of old cars according to this chart, which appeared in the Automobile Manufacturers Association data book. Original source of information was the "Automobile Registration Characteristics" of the U. S. Public Roads Administration, published April 30, 1934.***



Engineers Use New Utility Boat For Construction of Aluminum Bridges

Washington

• • • **A new, twin-screw** utility power boat, capable of propelling bridge-rafts or ferries with loads up to 80 tons in swift currents, is now being shipped overseas by the Army Engineers.

Designed primarily for service with the new M-4, all-aluminum bridge and now under high priority production, the new boat is one of several on which boat manufacturers have been pushing production to meet the need of Engineer units.

Developed by the Engineer Board, Fort Belvoir, Va., and tested at the Colorado River test station, the new boat is 25 ft. long, has an 8-ft. beam, a 32-in. draft and weighs 5500 lb. (dry).

The twin-screw boat has sufficient strength to withstand beaching with ample protection for propellers and rudders. The boat is easily retracted under its own power as long as its propellers are in the water. A large, ribbed, working deck has been provided by reducing the cockpit and control station area to minimum.

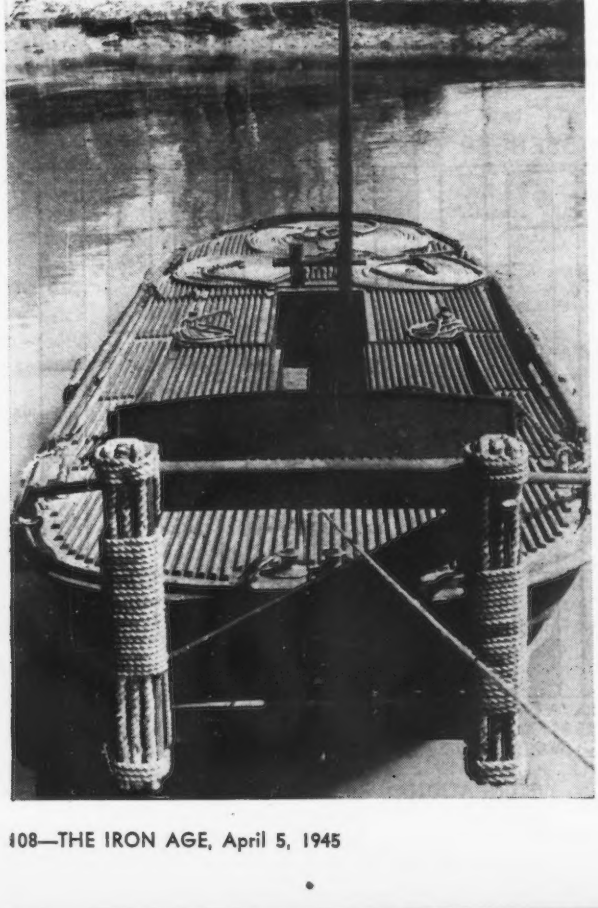
The new boat is prepared to live up to its title of "utility" boat through its possession of special equipment. On the bow is a detachable pushing knee which serves as a bumper cushion in rafting and ferrying operations. A collapsible derrick, capable of lifting 1500 lb. when mounted on the stern and 1200 lb. on the bow, is provided. Other equipment includes an 8-ft. mast with running lights, a towing bit on the stern and lifting rings which permit the boat to be handled by a crane.

This new boat is being made by the following firms: C. V. Hill Co., Trenton, N. J.; Nassau Boat Basin, Inc., Freeport, N. Y.; Island Dock, Inc., Kingston, N. Y.; and the Robinson Marine Construction Co., Benton Harbor, Mich.

The former standard utility power boat which is still very much in demand is a solid, 18-ft. single-screw boat, powered by a 57 hp. marine engine. In ordinary currents it can handle all the floating equipment of the engineer unit to which it has been assigned, including treadway bridge companies and the light and heavy pontoon bridge units.

Typical of the splendid response of boat manufacturers to the Corps of Engineers' need for boats, is the record made during one critical emergency by Penn Yan Boats, Inc., Penn Yan, N. Y. Able to work only one shift a day, the employees stretched their shift to 79 hr. per week during which time, in place of the normal weekly production of 40 boats, the company turned out a total of 83 of the badly needed 18-ft. craft.

One type of boat, the plywood storm boat, was recently transported by air to a theater of operations to meet emergency needs. The storm boat is used in the initial storming of enemy-held river banks when engineer boat crews transport the infantry who clear the area for the building of bridges.



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UTILITY SHIP: *The Engineer's Corps is using this new boat to assist in the construction of pontoon bridges, including the new fast water aluminum M-4 model.*

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WPB Tightens Sales On Used Steel Rails

Washington

• • • **Effective March 26,** WPB in an amendment to L-88 tightened controls over sales of all grades of used steel rails other than those to be used for laying track.

The amended order provides that sales of used rail of relayer grade may be made:

1. By common carriers directly to industries for the purpose of laying track without restriction and without certification.

2. To any person, other than dealers, without prior authorization, provided the purchase order is certified to the effect that the rail is to be used for laying track.

3. To dealers without authorization, provided the dealer's purchase order is certified to the effect that the rail is purchased for subsequent resale in accordance with Order L-88.

Any amount of used rail or relayer grade in excess of 10 tons to be sold in any calendar month for any other purpose requires prior authorization from WPB. The new restrictions also bring the Army, Navy, and Maritime Commission within the scope of the order.

The order as previously written did not provide for sales of used rails to dealers and reconditioners of used rails, who had formerly purchased rails and sold part of them for track work and part for other purposes.

OPA Issues Simplified Order On Machines and Equipment Pricing

Washington

• • • OPA on March 26 issued simplified regulations covering the pricing of machines, parts, industrial equipment, industrial services and industrial machinery repair services which became effective March 31. MPR 136, governing ceilings on machines, parts, and industrial equipment was revised and a new regulation MPR 581 providing maximum prices for industrial services were issued.

Although the revision of MPR 136 does not change the general level of maximum prices, it does change pricing methods, depreciation classification for second-hand products and reporting and record keeping requirements.

To make it easier to determine prices and to administer the regulation, the revision defines "established prices in effect on the base date" as those prices at which the manufacturer actually contracted to sell the item during the six months prior to the base date.

To make it easier for resellers to figure maximum prices for items on which they did not have a maximum price on the base date, the manufacturer's suggested resale price on that base date, or OPA approved resale price must be used in determining ceilings. An "in line" limitation has been placed on the manufacturer's maximum prices for most new electrical items. To avoid confusion to manufacturers, all springs for mechanical instruments have a base date of March 31, 1942.

The regulation's depreciation rates for electrical equipment are based on an average of figures for estimated useful life of equipment and machinery applied by the Bureau of Internal Revenue.

The exemption for cost-plus contracts has been removed from RMPR-136 for the few reports of cost, plus contracts filed with OPA indicated this provision was no longer needed.

The supply of installation and erection services by manufacturers has been removed from the regulation's coverage and placed under the provisions of MPR 251, construction services and sales of installed building materials. MPR 251 is more liberal than was MPR 136 in that it permits adjustments to reflect increased wage costs.

Metal parts and subassemblies of consumer items, such as washing machines, mechanical refrigerators, vacuum cleaners, fire arms, ice boxes cast iron boilers and radiation, radios and phonographs, etc., have been added to the regulation's coverage when sold by the parts manufacturer to the manufacturer of the complete item. Heretofore, some of these parts and subassemblies were covered by MPR-136 while the remainder were covered by the General Maximum Price Regulation.

The formula provisions of RMPR 136, however, are specially designed to provide a pricing method for manufacturers of non-standard items. The change in coverage will not affect the general level of the prices of these items, since GMPR has a March 1942 base period and RMPR 136 has a March 31, 1942 base period for these items.

In computing a price under MPR 581 the first applicable method listed determines the maximum price. Methods are: (1) Rates in effect on March 31, 1942; (2) the highest price charged between Jan. 1, 1942 and March 31, 1942; (3) the same method of computation that was in effect on March 31.

When a service is performed under the regulation of a type not previously performed, the supplier is required to compute a tentative price for the trial run. The maximum price must be computed on the basis of March 31, 1942 costs, and he must use the actual experience in developing costs which he secured on the trial run. After he computes the maximum price based on his March 31, 1942 costs and the cost experience gained in the trial run, the maximum price applies to all contracts included in the trial run.

If the shop was not in business during 1944, or if in business and sales amount to less than $75,000, the application for service rates should be filed with the District Office of OPA in the district.

Receives Tank Hull Order

Detroit

• • • The Warren City Mfg. Co., subsidiary of Graham-Paige Motors Corp. has received a new order for Army tank hulls totaling approximately $13,000,000, to be fabricated for International Harvester Co. Deliveries will begin in June.

Unfilled orders of the Warren City plant now exceed $20,000,000, and monthly shipments are breaking previous records.

HEAVY SLEDDING: *Ten-ton steel sleds, for use by Army Engineers in Europe as portable beds for emergency power plants, are inspected at the Graham-Paige subsidiary in Warren, Ohio. As the Nazis blow up power stations in their retreat, the Engineers haul generating units into the area to supply current.*

Industrial Briefs . . .

• VERSATILITY — Using steel methods and equipment, Weirton Steel Co., a National Steel subsidiary, has produced large quantities of rolled magnesium following its success in rolling brass for the government. According to E. T. Weir, board chairman, Weirton has also rolled silver chloride. Another National Steel subsidiary. Great Lakes Steel Corp., as sole supplier of the Navy Quonset hut has already delivered more than 100,000 buildings.

• GRANTS LICENSES—According to U. S. Pipe & Foundry Co.'s annual report, licenses to manufacture pipe under the company's centrifugal process patents have been granted to Altos Hornos de Mexico, S. A., and to the Glamorgan Pipe & Foundry Co. of Lynchburg, Va. The company recently disposed of its interest in the Duraloy Co., Scottdale, Pa.

• AIRCRAFT PROBLEMS — Problems and prospects of the aircraft and air transport industries will be discussed at a series of 10 2-hr. meetings sponsored jointly by the Chicago Association of Commerce and the University of Chicago. The meetings will be held each Tuesday evening at the LaSalle Hotel beginning April 10. The final session will be June 12.

• COPPER CLAD STEEL—During 1944, 66 per cent of Superior Steel Corp.'s dollar sales were in copper alloy clad steel going primarily into ammunition requirements. This represents a reduction from the previous year. Superior in 1944 made a voluntary reduction of approximately 20 per cent in the price of its clad metal. The company has installed an experimental mill for the purpose of producing clad metals of various combinations.

• ANXIOUS BIDDERS—More than 1000 bidders showed up at the liquidating auction sale of machinery, equipment, and supplies of the Bison Shipbuilding Corp. at North Tonawanda, N. Y., recently. Because so many contractors and war plant representatives bid up to the ceilings for scarce items, awards were determined by lot. The Bison shipyard suspended operations last December after building 241 landing craft-tank for the Navy.

• POSTWAR PLANT — Fisher Body Division of General Motors Corp. will erect a postwar plant in Columbus, Ohio, to manufacture automotive hardware, to function under the Ternstedt Division at Detroit. The plant will employ between 7000 and 8000 workers.

• VETERANS MANUAL — Allis-Chalmers Mfg. Co. in cooperation with the Wisconsin Society for Mental Hygiene, has published a manual for the use of its supervisory force in their relationships with returned war veterans. The company already has employed more than 1100 veterans of this war.

• JOINS STAFF—Dr. J. R. Van Pelt, Jr., until recently technical director of the Museum of Science and Industry, in Chicago, has joined the staff of Battelle Memorial Institute, Columbus, Ohio. Dr. Van Pelt will head Battelle's program of research education.

• SIGNS CONTRACT—Gould Storage Battery Corp., Depew, N. Y., has announced the signing of a contract with the Pressed Steel Car Co., Inc., Pittsburgh, whereby Pressed Steel will act as exclusive agents for the export of Gould industrial storage batteries. This will cover all parts of the world except Canada.

• AWARDS — Dr. Rupen Eksergian of Philadelphia will receive the Levy medal of the Franklin Institute for his paper "On the Reaction of Fluids and Fluid Jets." Dr. Zay Jeffries, General Electric Co., is the winner of the Clamer Medal of the Institute, for his meritorious contributions to the science of metals.

Newest Pipeline To Be 1300 Miles Long, Using Welded Pipe

Pittsburgh

• • • **Application has been filed** by the American Light & Traction Co., to build a new gas pipeline from Oklahoma to Detroit, a distance of about 1300 miles, requiring some 250,000 tons of steel for the manufacture of the pipe to be used in the job. Plans are for welded pipe, ranging in sizes from 20 to 26 in., which will, it is believed, be fabricated by the A. O. Smith Co.

The job will apparently be a low pressure line and is just about the first really big pipeline job undertaken since the war started that comes under a "civilian" category. While it will undoubtedly be used in serving war industries, it will be mainly a general fuel gas supply line for the Detroit area. Construction is scheduled to begin on May 1, and plans presently call for 65 miles of 20-in., 300 miles of 22-in., and 900 miles of 26-in. pipe.

The proposed pipeline is of considerable interest to plate producers since most of them now have openings in plate rolling schedules from May through to the end of the year. Consequently, active solicitation of this business is being made, and hopes are that it will help substantially in filling many gaps in present rolling schedules.

Line of Cold Formed Steel Sections Seen Being Standardized

Pittsburgh

• • • **Work on standardizing** a new line of cold formed steel sections, to be formed from strip steel is about reaching a conclusion, and while these items will probably not be marketed until after the war, steel companies are preparing to manufacture and distribute them. (See THE IRON AGE, Dec. 28, 1944, page 90). Some steel producers already have certain cold formed steel sections, such as the H. H. Robertson Co. section and the Stran-Steel section of Great Lakes Steel Co., used in building construction. These items will be continued, but a great deal of work has been put into the standardization of an entirely new line of products that includes angle, Z, T, U, bulb angle, channel,

and I sections, as well as others, in a variety of sizes and thicknesses.

This will permit buyers to purchase such sections from any of a number of sources, and the product will be uniform. The bulk of such products will be made from strip steel in thicknesses ranging from 18 to 10 gage, it is said. The products will be available for a wide variety of uses that do not require strength factors as great as those attainable in hot rolled sections. Such uses are in light commercial buildings, school buildings, apartments, residences, as well as in a variety of consumer products such as the side rails in bed springs, library book stacks, and other items.

Steel Men Relax With Coal Respite

Washington

• • • With uninterrupted coal production promised for at least a month as the result of the agreement of UMW President John L. Lewis, to permit continued operation during that period under the old contract, the steel industry is given a breathing spell in which to build up stocks.

Under the agreement between UMW and coal operators any wage adjustments made will be made retroactive to April 1.

Mr. Lewis' agreement to drop his demand for a royalty on production did not come as a surprise.

Coal Miners' Return To Work Is Delayed

Pittsburgh

• • • Despite the fact that the mine holiday, John L. Lewis Day, ended at midnight Monday, Tuesday found 24 mines in the Western Pennsylvania area completely down and absenteeism was running very high in many others. Coal production was far below normal. It is estimated that some 10,000 miners in the district were idle. The miners were ordered back to their jobs by the United Mine Workers, but it is believed that the slack in operations is the result of a "continued holiday" rather than a strike. Among the mines down were eight of Pittsburgh Coal Co., seven of H. C. Frick Coal and Coke Co., the Vesta mines of Jones & Laughlin Steel Corp., Weirton's Isabella mine, and four mines of Westmoreland Coal Co. There were several other mines where operations were not resumed, and some where production has been cut to a minimum because of absenteeism.

Rails Maintenance Expenditures Upped To New Record Year

Washington

• • • Capital expenditures for equipment and other improvements to railway property made by Class I railroads in 1944 totaled $560,112,000, the greatest for any year since 1930, the Association of American Railroads announced recently. Such expenditures in 1944 were an increase of $105,830,000 above those in 1943.

Of total capital expenditures made in 1944, $328,231,000 were for locomotives, freight-train cars, passenger-train cars and other equipment and $231,881,000 for roadway and structures. Capital expenditures for equipment exceeded by $72,250,000 those in 1943, and expenditures for roadway and structures were $33,580,000 above the preceding year.

Capital expenditures for locomotives in 1944 totaled $178,017,000 compared with $142,070,000 in 1943.

For freight-train cars, capital expenditures amounted to $134,533,000, compared with $97,890,000 in 1943.

For passenger-train cars, the amount of capital expenditures totaled $1,921,000 in 1944, the smallest amount spent for that purpose in any year since 1922, the first year such reports were filed. In 1943 such expenditures totaled $5,828,000. Expenditures for other equipment last year amounted to $13,760,000, compared with $10,193,000 in 1943, and $10,353,000 in 1942.

Of the $231,881,000 spent for roadway and structures, about $100,000,000 was used for improvement of tracks and sidings. For additional track, capital expenditures in 1944 totaled $20,616,000 compared with $18,493,000 in the preceding year. For yards and sidings, expenditures in 1944 totaled $36,666,000 compared with $39,254,000 in the year before, and for heavier rail the railroads spent $35,720,000, or an increase of $3,493,000 above such expenditures in 1943. Expenditures for shops and engine houses in 1944 amounted to $28,131,000, or an increase of $12,516,000 above the year before.

Capital expenditures made annually by the Class I railroads in the past fifteen years follows:

1944	$560,112,000
1943	454,282,000
1942	534,897,000
1941	543,021,000
1940	429,147,000
1939	262,029,000
1938	226,937,000
1937	509,793,000
1936	298,991,000
1935	188,302,000
1934	212,712,000
1933	103,947,000
1932	167,194,000
1931	361,912,000
1930	872,608,000

STRIKE VOTE: *Soft coal miners cast their ballots at Pittsburgh Coal Co. mine at Library, Pa., March 28, on the strike question. The poll was conducted by the National Labor Relations Board among all bituminous coal miners.*

Price Adjustment To Be Held by OPA

Washington

• • • **Steel price adjustment promised** by OPA to compensate steel companies for out of pocket losses may have to wait until after VE-day because it is reported that OPA Administrator Chester Bowles has ordered re-analysis of cost and profit figures under new criteria.

For several weeks it has been common knowledge that the OPA had completed studies justifying price increases amounting to perhaps $100,000,000 annually to the steel industry. Now, it appears that this task must be re-done.

Considering the probability of an early cessation of organized German resistance, it is quite likely that new cost and profit data may have to be resubmitted by the industry at OPA's request to show reduced costs because of the shortened work week and the abolition of overtime.

Oddly enough when OPA promised price adjustment in January the agency specifically said that the adjustments were not to compensate for wage increases previously granted by WLB, but should be done as a "matter of law." Now, OPA without compensating for the increased costs resulting from WLB's fringe wage awards of last November which was an assessment on the industry of $100,000,000 according to OPA itself, proposed to include a reduced wage bill in new readjustment of prices on account of the ending of the European War.

Todd Shipbuilding Corp. Interested in San Francisco

Seattle

• • • **Todd Pacific Shipbuilding Corp.** of Seattle is authoritatively reported seeking repair yard facilities on San Francisco Bay and has been negotiating with the Maritime Commission in an attempt to purchase the west yard of the Moore Drydock Co. at Oakland. It is understood that Moore has first option to purchase this government-owned adjunct to its long established repair yards on the Oakland estuary. The west yard has been active in new construction of special Maritime and Navy auxiliary craft for the past three years but contracts have been largely completed and the yard is now available for new or repair work. Todd operates major construction yards at Seattle and Tacoma and a separate long established repair yard at Seattle. Todd recently acquired yard facilities on Los Angeles harbor. It is understood that Todd was interested in the purchase of the United Engineering Yard facilities at Oakland prior to their recent acquisition by Matson Navigation Co. Prior to the outbreak of the war the Todd California Corp. was formed to operate a yard at Richmond for the construction of cargo vessels for the British Government but this yard was subsequently taken over by the Kaiser interests.

Republic Working Capital Increased

Cleveland

• • • **Working capital of** the Republic Steel Corp. during 1944 was increased to $130,698,268, the highest in the company's history, according to the annual report sent to stockholders this week.

Operating at 99.8 per cent of capacity, fractionally lower than the 100.4 per cent for 1943, Republic's plants produced 8,400,426 tons of ingots. This was reflected in the slight decline in sales volume, which for 1944 totaled $531,235,302, compared to the 1943 all-time high of $552,329,733.

According to the report, the decline in dollar sales volume is due primarily to a change in emphasis in the grades of steel required rather than to a reduction in over-all tonnage shipped. To a considerable degree, lower grades of steel at lower prices replaced more highly specialized products during the year, and the resulting reduction in dollar volume had a corresponding effect on earnings.

In discussing the postwar period, Republic officials pointed out that substantial reconversion would be involved in only three of the corporation's manufacturing plants. At the Youngstown plant of the Truscon Steel Co. virtually all of the normal production equipment has been removed and the plant has been converted to the manufacture of tank treads, Navy ship sections, aluminum airplane fuselages, and to the complete overhauling of mobile Army equipment including half tracks and scout cars. Berger Division, plant No. 2, which formerly produced building materials, has been completely converted to the fabrication of aluminum airplane assemblies.

CIO Aims at Airframe Wage Scale Increase

Detroit

• • • **The CIO United** Automobile Workers union has made "a final formal request" for action by Secretary of Labor Frances Perkins to raise the minimum rate in the airframe industry from 50c. to 75c. an hr., and unless such action is taken, will start suit to bring it about under the Federal Public Contracts Act.

The Department of Labor determined in 1938 that a minimum rate of 50c. an hr. was justified. Since then most rates have gone up, and the union maintains that official Department of Labor publications show that wages in the airframe industry, advancing more than 42 per cent since 1941, have raised the prevailing minimum rate to 75c. an hr.

The Public Contracts Act provides that, "All persons employed by the contractor . . . will be paid . . . not less than the minimum wages as determined by the Secretary of Labor to be the prevailing minimum wages."

If the rate were to be raised to 75c., it would provide the UAW with a springboard for seeking further advances, in line with its admitted policy of attempting to raise rates as far above the minimums as possible. Comparatively few companies, and these usually in isolated cases, are now paying below the proposed 75c. minimum and would be affected

Stainless Tube Plant Grows

Beaver Falls, Pa.

• • • **The Babcock & Wilcox** Tube Company here, long associated with seamless tubing, is expanding facilities to include the manufacture of atomic hydrogen welded tubing and pipe, it was announced recently.

The rotary piercing method is for larger diameters and heavy walled tubing such as cracking still tubes and the like, while the atomic hydrogen welded process is better suited for smaller sizes of tubing such as are used in the food and chemical industries. Regardless of the initial method of manufacture, the tube company facilities for subsequent processing such as annealing, pickling, cold drawing, straightening, etc., are identical.

Among the new facilities being added in the consolidation of a stainless producing unit are a salt bath for pickling and a conveyor furnace for heat treating.

Kingdom of the Saguenay; Canada's Sprawling Aluminum Giant

Arvida, Quebec

By JACK HIGHT

o o o

• • • The mile long stretch of potrooms comprising the smelting facilities of the Aluminum Co. of Canada here promises to be the largest unknown factor in the postwar aluminum field. Proven capable of producing at a rate of 700,000,000 lbs. per year, these lines can produce ingots amounting to 20 per cent of the total North American production. In contrast, the Aluminum Co. of America's largest plant at Alcoa, Tenn., is rated at 357,500,000 lbs. per year.

The aluminum plant here is furnished with power from the waters of the historic Saguenay River, dammed first in the late twenties, and now the site of a 12 generator powerhouse known as Shipshaw No. 2, with a firm output greater than that of Boulder Dam.

Location of the plant at it power source, yet within a few miles of tidewater ports on this tributary of the St. Lawrence River, gives the Aluminum Co. of Canada important economic advantages that make it the envy of many other of the world's light metal producers.

With this metal capacity and power installed, financed under about as favorable terms as a war plant could be, executives of the Aluminium Limited group, which owns the Aluminum Co. of Canada, are of course spending certain of their idle hours in discussions of the postwar future of this air-way baby.

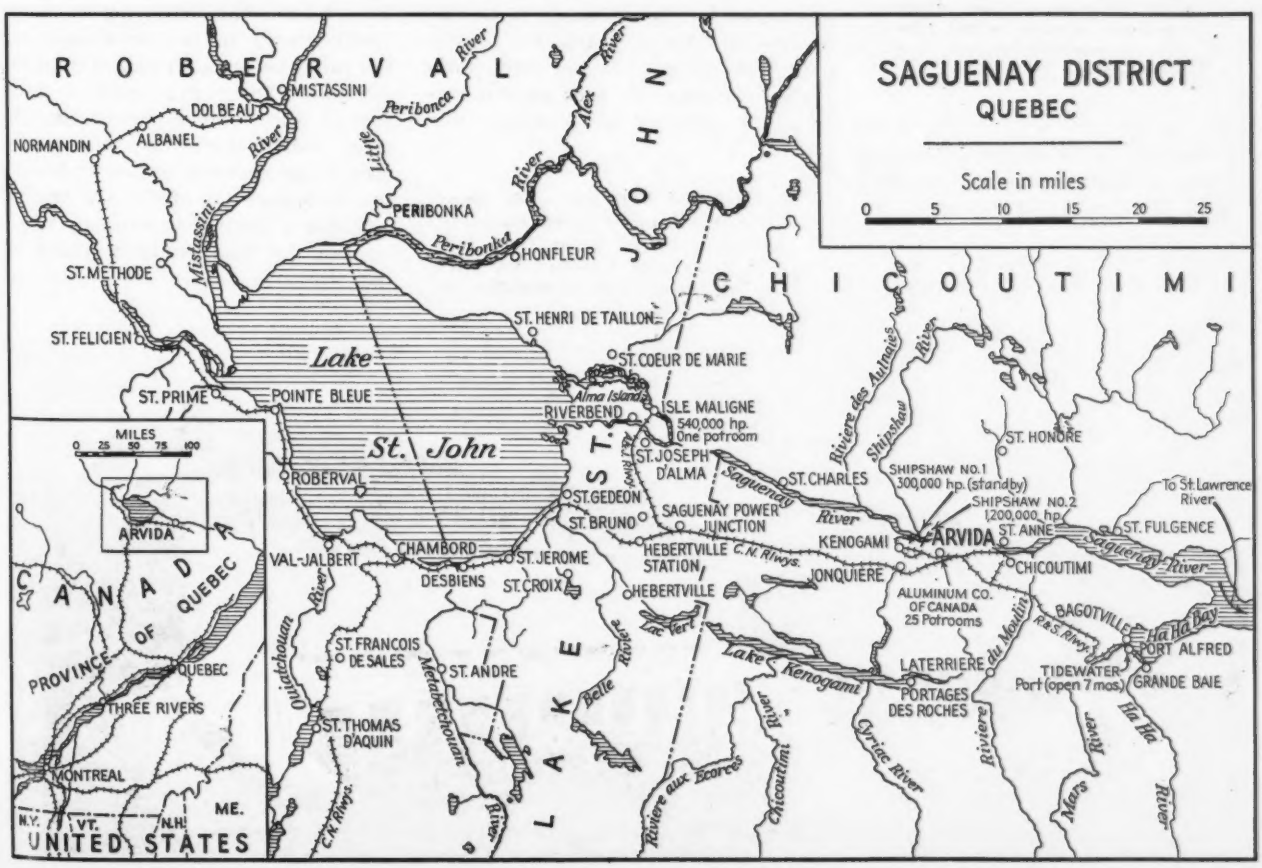
Realistically facing a certain drastic drop in aluminum demand in the immediate postwar period, many of the finishing touches on the wartime construction have been purposely delayed to offer work to the inhabitants of Arvida in slack periods. Meanwhile the facilities of Aluminium Laboratories, Limited, the research staff of the group, will be devoted to the development of new uses for the light metal, and the sales group will continue to work in the export market in which this Canadian firm is interested.

o o o

FRENCH CANADIAN ALUMINUM:—*In the heart of northern Quebec at Arvida the Aluminum Co. of Canada has erected the world's largest aluminum plant, with 25 potrooms in operation at its war peak.*

Attracted by the necessity for borrowing from banks on metal produced during the depression of the '30s, the company joined the international cartel, incorporated as the Alliance Aluminium Co. at Basle, Switzerland, which is no longer in operation. Whether the possible profits to accrue from having a very economical production unit unscarred by the war to throw into a free competitive world market will encourage Aluminium Limited to bolt any possible future association remains to be seen.

In the words of Vice-President H. H. Richardson of Aluminium Laboratories Limited, "We will tend to emphasize the importance of aluminum in the transport field, for anywhere that inertia must be overcome to



POTROOM LABOR:—*Working temperatures in the potrooms at Alcan's Arvida were the subject of a provincial investigation some time ago. The French Canadians working in the plants were formerly principally agricultural workers.*

move weight, the higher cost of the production of aluminum in comparison to other metals can be made to pay for itself." He also mentioned the high development of the European industry in the container field prior to the war, pointing out the fact that in this particular field there is no return metal problem, and predicted wide developments in this field.

While recognizing that the railroads and automotive firms are traditionally among the most conservative of the business world, Mr. Richardson disclosed that both the Canadian National and the Canadian Pacific Railways are interested in aluminum freight cars, although work with passenger cars has not progressed as far in the United States. He also stated that major automotive companies have cooperated with his firm in considerable research that points to important uses for aluminum in new car models.

Despite the overall advantages of the plant located here in Saguenay river valley there is little if any justification for the belief that this plant can produce the ingot 40 per cent cheaper than any other plant on the continent, as was recently asserted by R. S. Reynolds, president of Reynolds Metals, before the U. S. Senate Small Business Committee. Exact costs, of course, are impossible to even closely predict, although the factors that will go to make up such costs can be roughly described.

Through the Demarara Bauxite Co., Ltd., a subsidiary company, large reserves of high grade bauxite are owned in British Guiana, considered by Dr. E. C. Harder, vice-president of Aluminium Laboratories and head geologist for the company, to be adequate for 50 plus years at a production rate equal to 50 per cent of the peak war rate. To back up this supply, the company also controls large reserves in Haiti, which have been mined only experimentally. Although the bauxite from this source has different characteristics than the Demarara ore, it would be satisfactory for use.

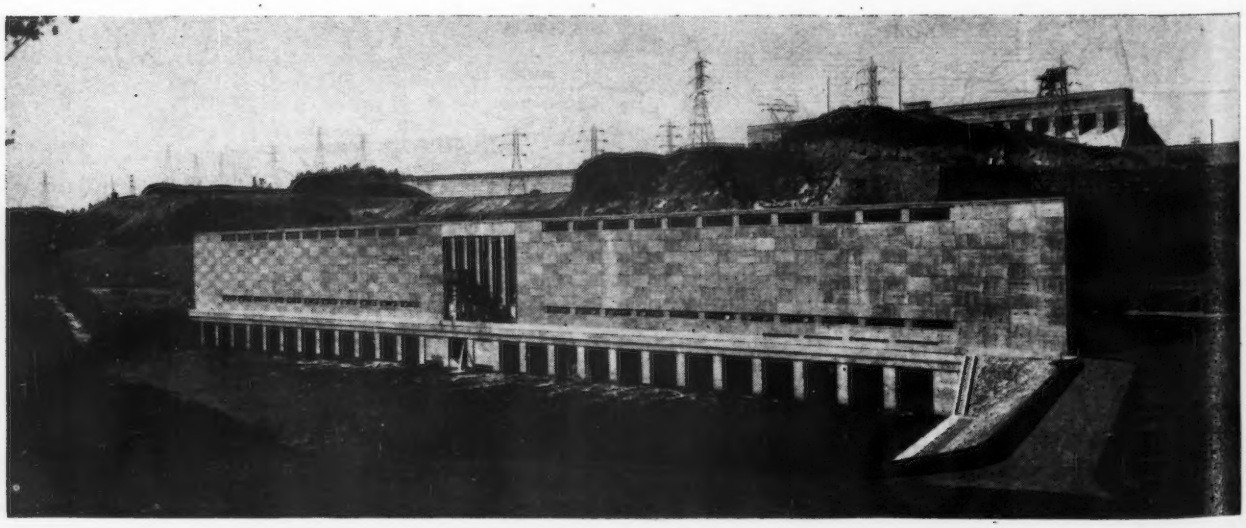
o o o

ALUMINUM POWER:—*The Shipshaw No. 2 power plant, using the waters of the Saguenay river furnish Alcan with a greater firm output of power than is available at Boulder Dam.*

The power potential at tidewater being one of the most important factors in selection of the plant site, the company is of course anxious to revert to the direct water shipment to its own port 20 miles below Shipshaw No. 2 at Port Alfred. The long range plan is to ship sufficient bauxite from May to November, when the port is open, to last through the winter months. Provision has been made for sheltered storage for this amount of bauxite to prevent freezing while wet.

As the war progressed and shipping losses pyramided, it became essential to shorten the water miles, so the raw ore was brought in by boat to various Atlantic ports and transshipped by rail. As merchant fleets have been rebuilt, it has become increasingly clear that in operation after the war they will restore the low freight rate which prevailed before the war, or possibly a lower rate. Although the company owned four ore vessels before hostilities began, the aluminum firm executives have not reached any definite conclusion on the economic advisability of further purchases of ore vessels.

The ore plant and potroom labor here in Arvida is largely native French-Canadian, enjoying a prosperity known to few inhabitants of the valley before acquiring their present jobs. The region knew a prosperous wood pulp business but the river valley itself has historically been an agricultural center. In Arvida the Aluminum Co. of Canada has established a benevolent company town, owning the land, building many of the workers' homes and approving



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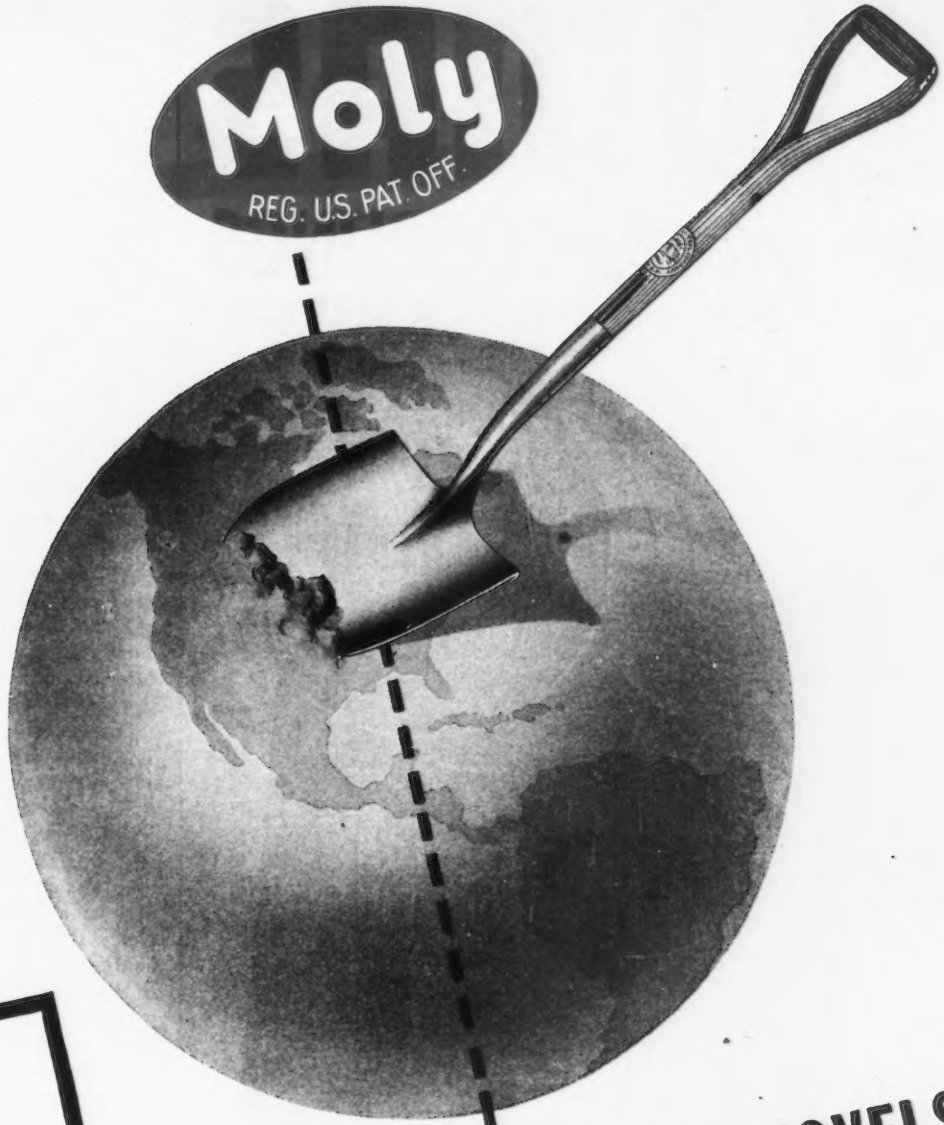

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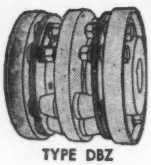
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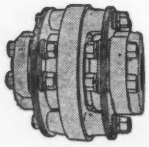
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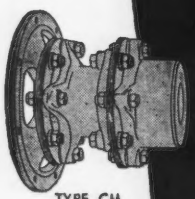
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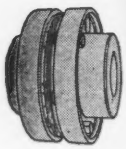
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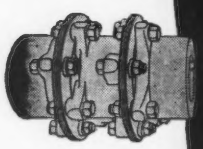
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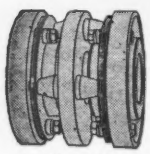
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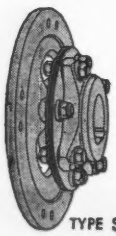
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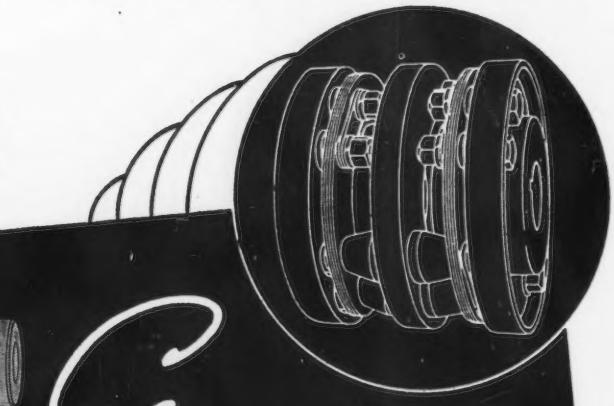

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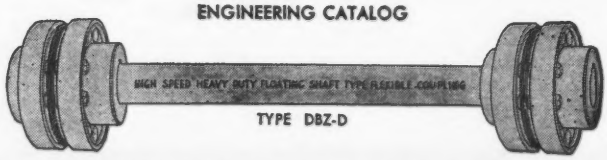

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the plans for those who build their own. The result is a handsome community, conspicuous in the quality of its homes, a fine recreation center furnished by the omnipresent company and a group of prospering independent merchants.

Despite the fact that certain elements of the provincial government feel that Arvida's workers are badly maligned, it appears doubtful that they will choose voluntarily to leave their present employment. In this district where the Roman Catholic religion is dominant, a local union known as the Catholic Syndicate has recently won bargaining rights in the plants in a contest with the AFL and CIO.

The aluminum ingot is the end product at Arvida as no fabrication or semi-fabrication equipment is located here. Although facilities for fabrication are owned by the group in other parts of Canada and in other countries, there appears to be considerable doubt as to the advisability of locating such equipment here.

Key to the company's rapid expansion during the early years of the war was the amount of power available to pour into the potrooms. Under capable maneuvering by Mac-Neely Dubose, Alcan's veteran power engineer, most of the power potential of the province was being borrowed over long transmission lines to operate the plant. As aluminum needs continued to expand the crystallization of plans for the large power development now known as Shipshaw No. 2 resulted in Dubose directing this project to its completion. Twelve 85,000 hp. generators were running in record time so that the No. 1 plant, completed in the '30s, is now considered standby equipment.

Dubose, whose first job here was the construction of the No. 1 plant, is now resident vice-president for the Aluminum Co. of Canada here in Arvida, and is often slyly called "King of the Saguenay" by his intimates.

From the four prewar potrooms in operation here before the war, the smelting plant, and a second aluminum plant grew apace, as the power became available for their operation. R. E. Powell, president of the Aluminum Co. of Canada, guided the expansion of the aluminum facilities in the early days of 1939 and 1940, when the product became the Spitfires of the battle for Britain, and later when Metals Reserve's orders reached astronomical proportions.

Today 25 potrooms are located at

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WAS RUINING FINISH

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Ended Chatter, Produced Smoother Operation, Cut Down Rejects

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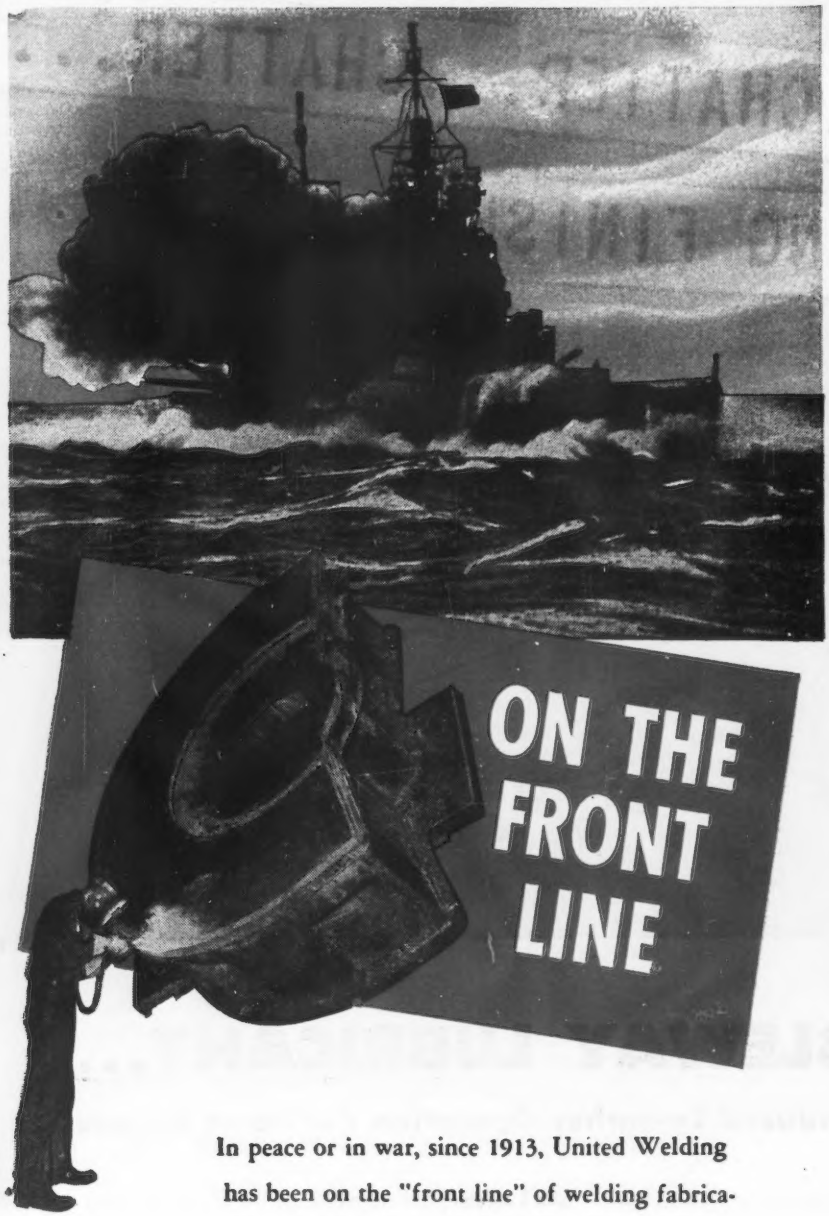

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Arvida, one new one is located at Isle Maligne, four new large-capacity and three old, small potrooms are located at the company's oldest works at Shawinigan Falls where the first production of aluminum in Canada was carried on in 1900. To operate these rooms some power is purchased from the Shawinigan Power Co. Ltd. At La Tuque the company has two new potrooms and two additional ones at Beauhamois. Although the above potrooms have never been operated for longer than a few months at full capacity their present installed capacity is about 300,000,000 lbs. per year.

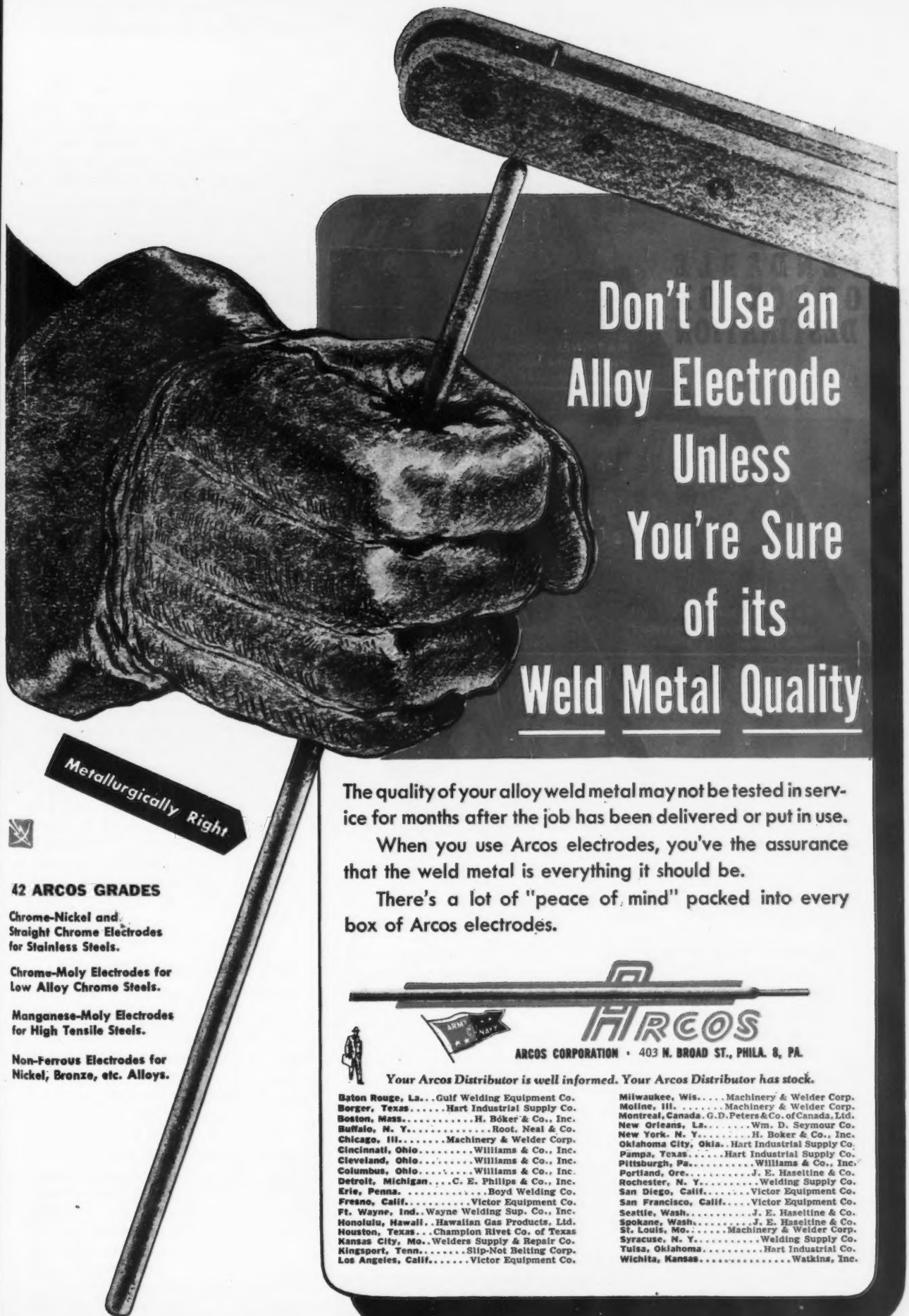
To finance this expansion Aluminium Ltd. has spent approximately $25,000,000 which it has borrowed

CANADIAN ALUMINUM
OUTPUT DURING WAR
BASED ON QUARTERLY RATE
39% of war output financed principally by advance payments from U.S. and British Empire
61% of war output comprised of pre-war capacity and expansion financed by British loan without special depreciation clause
1939
1940
1941
1942
1943
1944
1945

ALCAN FINANCING: *Most of the aluminum produced for the war by the Aluminum Co. of Canada was financed by the company's own expansion and that financed by a loan from the United Kingdom.*

from individuals, governments, and some of which is out of earnings. To expand ingot capacity in the early war years $49,500,000 were borrowed from the United Kingdom on a twenty year loan without any special depreciation feature. This loan at 3 per cent interest is to be repaid with an abatement feature that is regulated according to the use of the facility on a capacity basis. If fifty per cent of the capacity developed by the loan is used over the twenty years, fifty per cent of principal and interest must be repaid.

When further expansion was planned slightly more than $67,500,000 of U. S. and $15,200,000 United Kingdom, and Australian funds were borrowed, and $91,800,000 out of company funds were added. Some of the latter came from a 3½ per cent bond issue and a 5 per cent preferred stock sale. The borrowed funds for the



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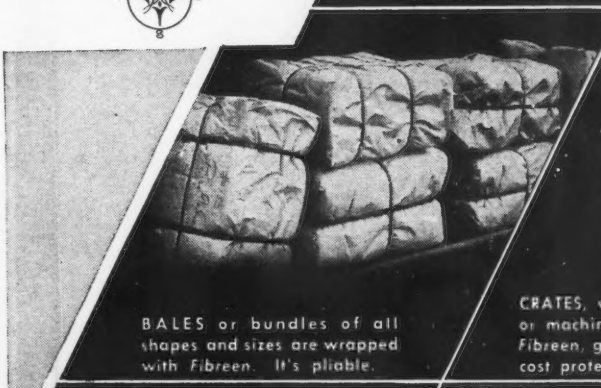

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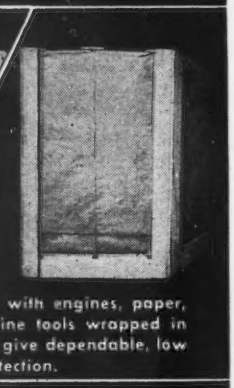

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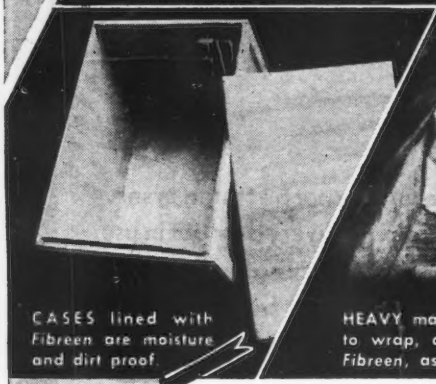

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most recent development contains a special depreciation clause similar to those common in the United States which permits the cost of the plants to be written off during the war rather than over a longer period. All of these figures are in Canadian dollars.

While the Alcan plants were cut back with other producers last September until they have been operating at about 50 per cent of total capacity, they are now working on greatly increased schedules, opening potlines that have stood idle for several months. New orders are being received with mixed emotions, as the swollen population of these Quebec towns was retracting to a more workable size under the slashed program, and it will be necessary for the company to bring workers back, possibly opening temporary camps for housing once again.

The fact that some American aluminum plants utilize power generated from coal, now a very short item, coupled with the fact that manpower is also unavailable in the U. S., is combining to expand the Aluminum Co. of Canada's schedules more than those of American plants.

While considering world export markets to be their field, Aluminium Ltd. is also watching with interest Prime Minister MacKenzie King's talks with President Roosevelt in regard to tariffs, remembering the 3c. per lb. barrier that exists today on aluminum (suspended for war shipments, of course). Company executives feel that the United States is and will be the largest mass market for aluminum ingot, and are looking to any market to use the tonnages available.

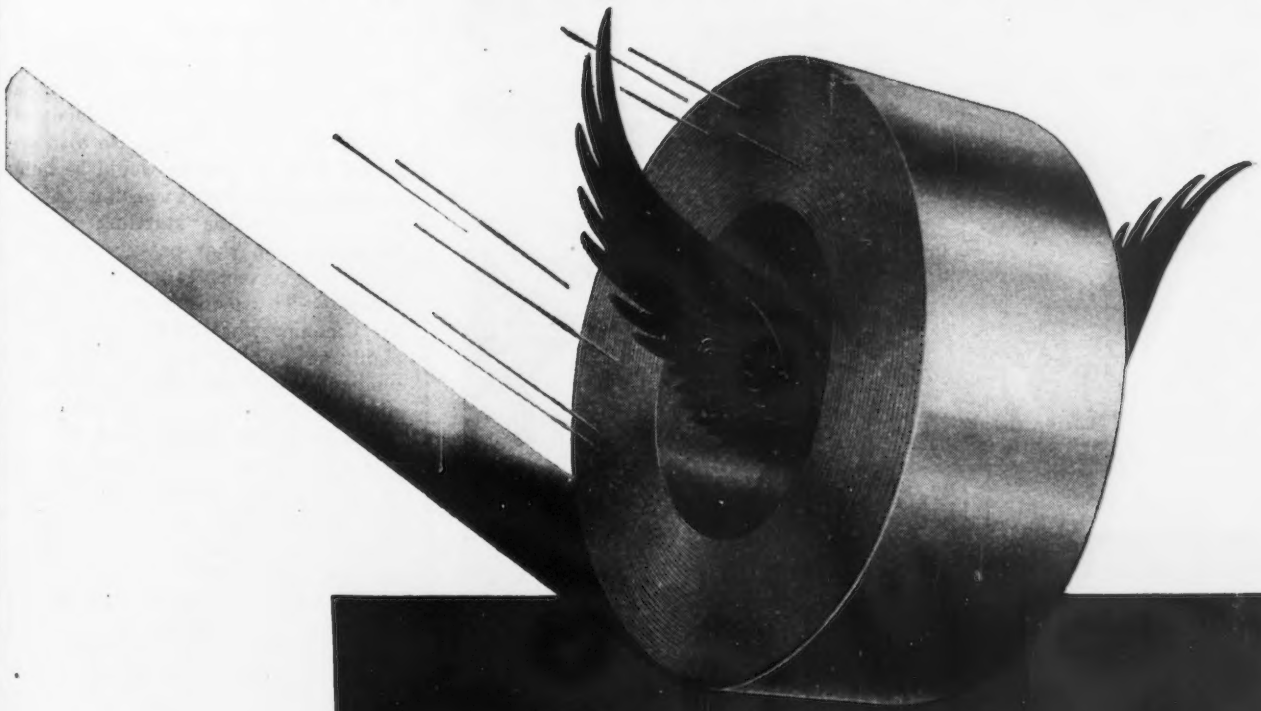
RFC Investigation Headed

Washington

• • • **Paul J. Cotter** has been appointed head of the RFC investigation unit, it was announced March 21. Mr. Cotter was formerly chief of the espionage unit of the Justice Department Criminal Division.

RFC said that the new unit will devise controls and other measures that may tend to prevent irregularities in connection with the agency's sale of government owned surplus capital and producers goods. Mr. Cotter will direct the investigation of alleged improper practices and complaints, collaborate with law enforcement agencies and act as a fact finding body.

Follansbee



for *Excellent Service* on COLD ROLLED STRIP

When you're in a hurry for Cold Rolled Strip—and can't risk the sacrifice of quality—Follansbee is a supplier which deserves your attention. For, even with production schedules crowded, Follansbee can frequently arrange shifts which permit the handling of additional orders to meet your emergencies.

This flexibility is of particular advantage when exacting specifications must be met. Under any conditions, Follansbee Cold Rolled Strip is produced to the precise temper, gauge, width and finish required.

Any time you'd like to put Follansbee to the test—on Cold Rolled Strip or other steels—you're invited to write, wire or telephone the Follansbee General Offices, or the nearest Follansbee Sales Office or Agency.

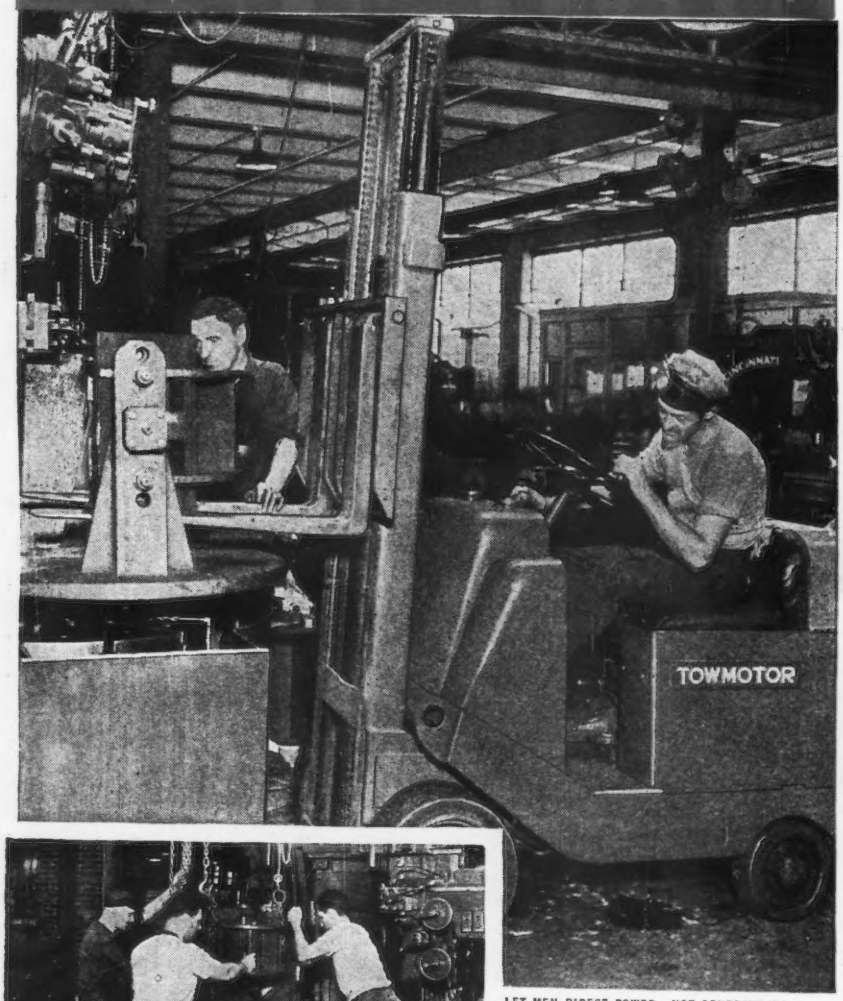
FOLLANSBEE STEEL CORPORATION

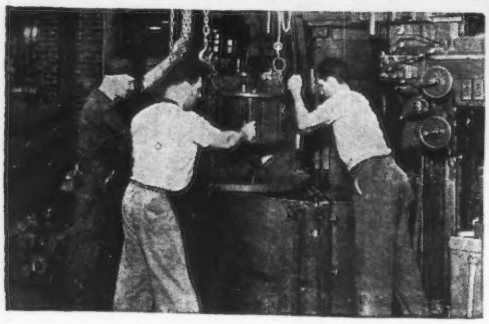
GENERAL OFFICES • PITTSBURGH 30, PA.

Sales Offices—New York, Philadelphia, Rochester, Cleveland, Detroit, Milwaukee.
Sales Agents—Chicago, Indianapolis, Houston, St. Louis, Nashville, Los Angeles, San Francisco, Seattle; Toronto and Montreal, Canada. *Plants*—Follansbee, W. Va. and Toronto, O.

ALLOY BLOOMS & BILLETS, SHEETS & STRIP • CLAD METALS • COLD ROLLED CARBON SHEETS & STRIP
POLISHED BLUE SHEETS • ELECTRICAL SHEETS & STRIP • SEAMLESS TERNE ROLL ROOFING

HANDLING+Processing+HANDLING+Assembling+HANDLING+Packing+HANDLING+Storage+HANDLING
HANDLING—the Common Denominator of PRODUCTION





LET MEN DIRECT POWER—NOT GENERATE IT!

New skills . . . developed by today's handling methods, contribute to faster, smoother manufacturing as well as storage and shipping operations. Such opportunities can be found in all phases of production and distribution.

Versatile Towmotor provides an important tool for these new skills—saves time, money and manpower. Get complete facts—write for the Towmotor DATA FILE today.

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Crosley Corp. to Stay In Automobile Field

Cincinnati

• • • **That the Crosley Corp.**, here, will continue in the small automobile business was verified by a statement of Powell Crosley, Jr., president of the corporation, recently. He also declared that the engine would be built in Cincinnati, and according to his statement would be "startling" in performance, and that patents to build it had been recently acquired. The assembly job would be done either in the Cincinnati or the Richmond, Ind. plant, he pointed out, and that the company might also enter the foreign market, where he believes the auto would have wide acceptance.

Discussing the new engine, details of which are not revealed, Mr. Crosley indicated that it was suitable for tractors, and that it was possible that the company might also construct them. "I have always felt that there was need in this country for a small car of this type," Mr. Crosley said. "Foreign countries have become used to them, but Americans have not. The engine will have four cylinders."

American Rolling Mill Increases Sales in '44

Middletown, Ohio

• • • **Sales of the American** Rolling Mill Co. in 1944 totaled $200,818,944, or $1,552,478 greater than in 1943. Net earnings in 1944 were $5,067,991, equal to $1.06 per common share. This compares with earnings of $6,098,074, or $1.42 per common share, in 1943.

In 1944, $2,240,000 was set aside to provide for postwar inventory revaluation and to absorb reconversion costs.

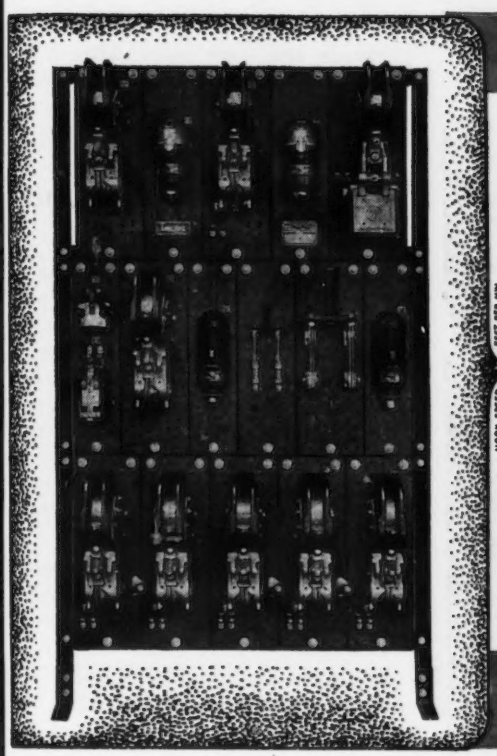
The American Rolling Mill Co. now owns a majority of the stock of the Rustless Iron & Steel Corp., and received $435,971 in dividends on its holdings during the year, the Armco report stated.

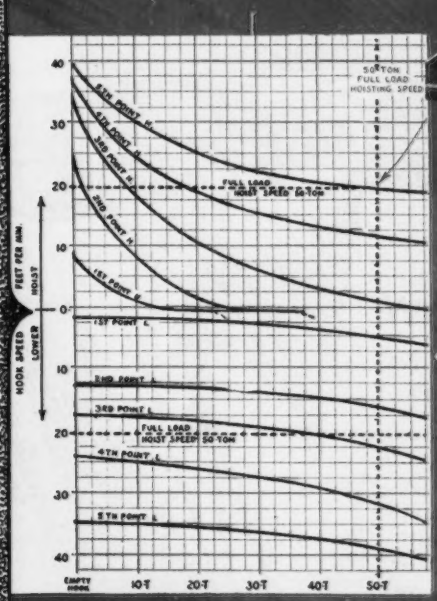
Advisory Committee Formed

Washington

• • • **OPA has announced** that 11 representatives of metal equipment manufacturers have been appointed to an advisory committee that will be available for consultation with that agency. At present civilian production of metal equipment is confined to the small amount that can be made under a few spot authorizations issued by

EC&M MAGNETIC Hoist Control... Assures IMPROVED Crane OPERATION



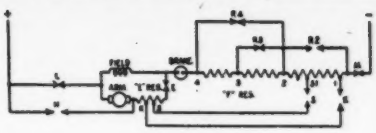


Performance curve of 50-ton crane-hoist operated by 90 H.P. motor. Crane efficiency—80%.

The compact Master Switch requires small space in the front of the operator. The control panel may be mounted at rear of cage or along bridge walkway.

MORE TRIPS PER MINUTE

Light loads or the empty hook lower at high speed as shown by the bottom curve at left. Also, operator has complete control of the load in lowering—brake sets immediately at the off point and, with dynamic braking assistance, brings the load to rest quickly. This results in fast operation and high output.

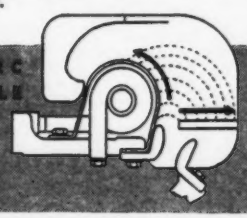


Quick Response because Brake Releases Instantly

All the current taken from the line on first point lowering goes through the brake coil, as shown in the above connection-diagram—an exclusive feature. This gives fast brake release, reduces number of controller-movements to spot a load—means less wear, too.

Line-arcs are Noted for Low Up-keep

Contacts operate cooler, last longer, because as they start to separate, the arc is immediately transferred from contact tips to arcing-plate and circular blow-out guard. Here it is centered between but not touching the arc shields—hence, no destructive burning of shields.



IT gives high output per crane-hour meaning a swift, steady flow of materials. It operates with exceptional smoothness . . . responds fast, accurately, aiding operator, especially, in spotting heavy loads.

Yet—besides all these advantages, EC&M Magnetic Control is noted for its low upkeep and easy maintenance. Many plants are replacing manual control on their d.c. cranes with this EC&M Wright Dynamic Lowering Circuit type.

Complete details are in Bulletin 921. Ask for copy.

THE ELECTRIC CONTROLLER AND MANUFACTURING CO.

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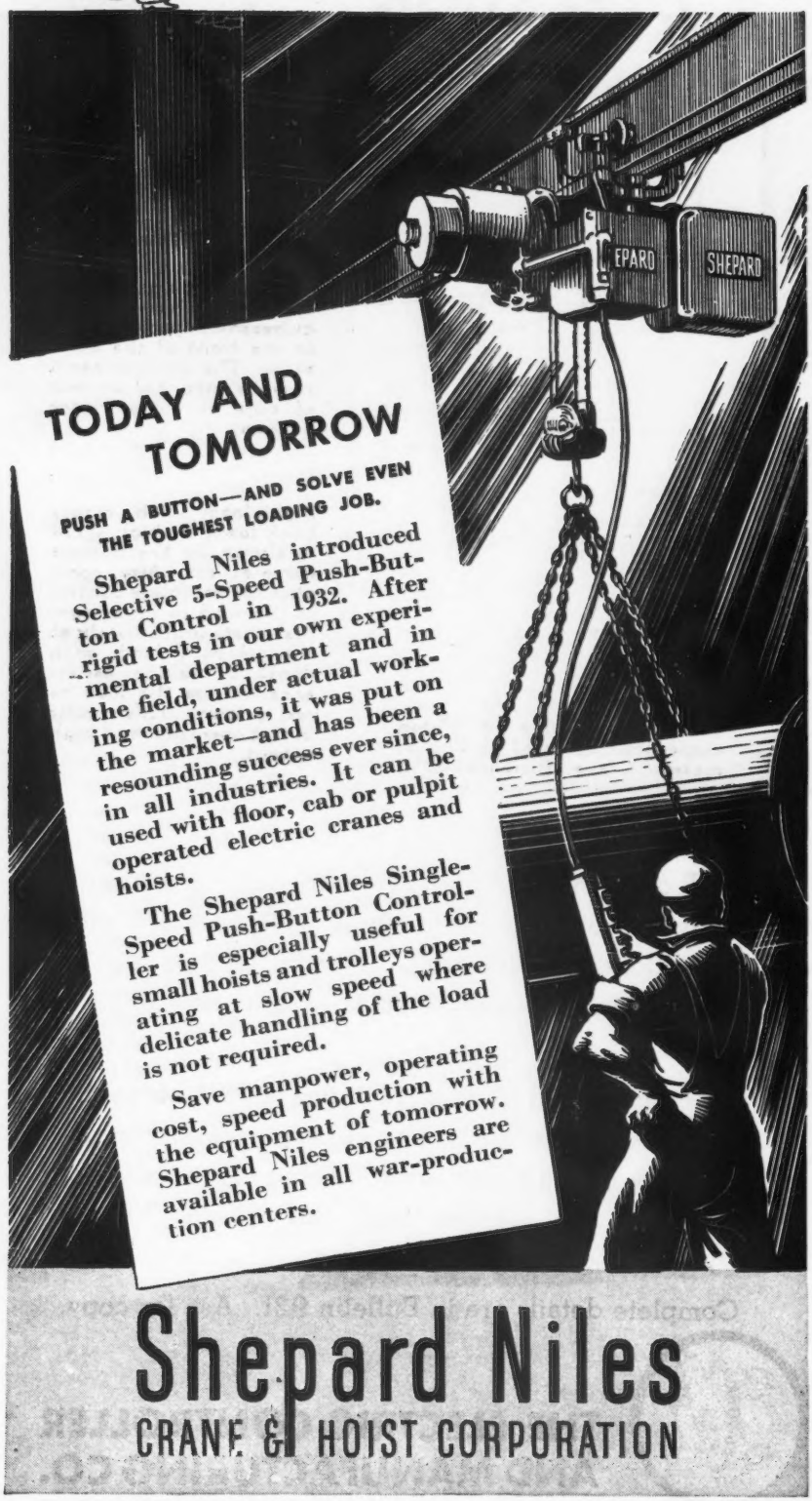
ONLY YESTERDAY...



TODAY AND TOMORROW

PUSH A BUTTON—AND SOLVE EVEN THE TOUGHEST LOADING JOB.

Shepard Niles introduced Selective 5-Speed Push-Button Control in 1932. After rigid tests in our own experimental department and in the field, under actual working conditions, it was put on the market—and has been a resounding success ever since, in all industries. It can be used with floor, cab or pulpit operated electric cranes and hoists.

The Shepard Niles Single-Speed Push-Button Controller is especially useful for small hoists and trolleys operating at slow speed where delicate handling of the load is not required.

Save manpower, operating cost, speed production with the equipment of tomorrow. Shepard Niles engineers are available in all war-production centers.

Shepard Niles
CRANE & HOIST CORPORATION

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WPB. One problem upon which the committee's advice will be sought, OPA said, is the pricing of sales by the government of large quantities of such equipment as shelving, lockers and office furniture, which is now in use in the war effort and which will presumably be sold when the war is over.

Other metal equipment manufactured by the industry includes food service equipment, beauty parlor, barber shop and store fixtures and signs. There are 1452 firms in the industry and annual production is valued at approximately $137,000,000.

Electrode Coating Unit

(CONTINUED FROM PAGE 65)

part of the transfer mechanism, which shuts down the whole plant in the event a rod gets out of alinement at any of the transfer points in the dryer. This transfer mechanism is an ingenious revolving carrier that literally picks up the rods from one pass and places them in the same alinement on the next, preventing dropping or rolling during the transfers.

In the drying oven, a number of innovations have been incorporated, including a continuous chain conveyor arranged so that seven passes are housed in an insulated chamber less than 4 ft. high and 25 ft. long. Closely controlled humidity is applied during the first two passes; a damper-balanced duct system provides constant circulation and excess heat and humidity are carried off through a duct connected to a vent in the building.

An insulated partition separates the upper, first two passes from the rest of the travel, and temperature as well as humidity are graduated to control drying speed, assuring the specified degrees of coating hardness in the finished rods. The oven is built in sections which, like the individual production machines in the plant, can be shipped as assembled units, minimizing erection problems when delivered.

McLelland Joins Luria

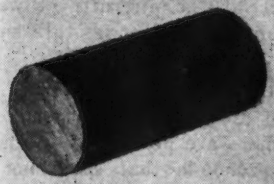
Detroit

• • • The Luria Steel and Trading Corp. has announced that W. K. McLelland, formerly with the Budd Wheel Co., has joined the staff of their Detroit office.

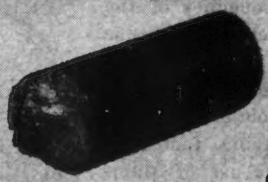
LOMA HYDRAULIC SHEAR AND NICK & BREAK MACHINE

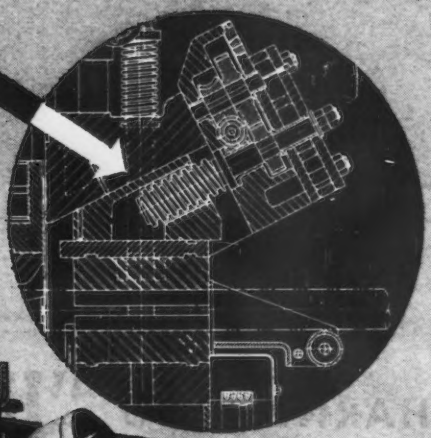
AIR OPERATED CLAMP
Wedge Action assures firm hold of stock

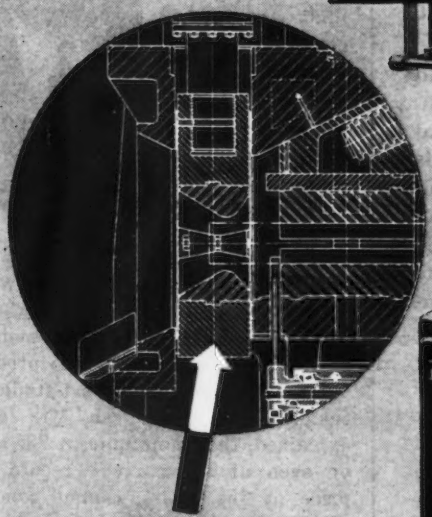
FOR A SMOOTH CUT

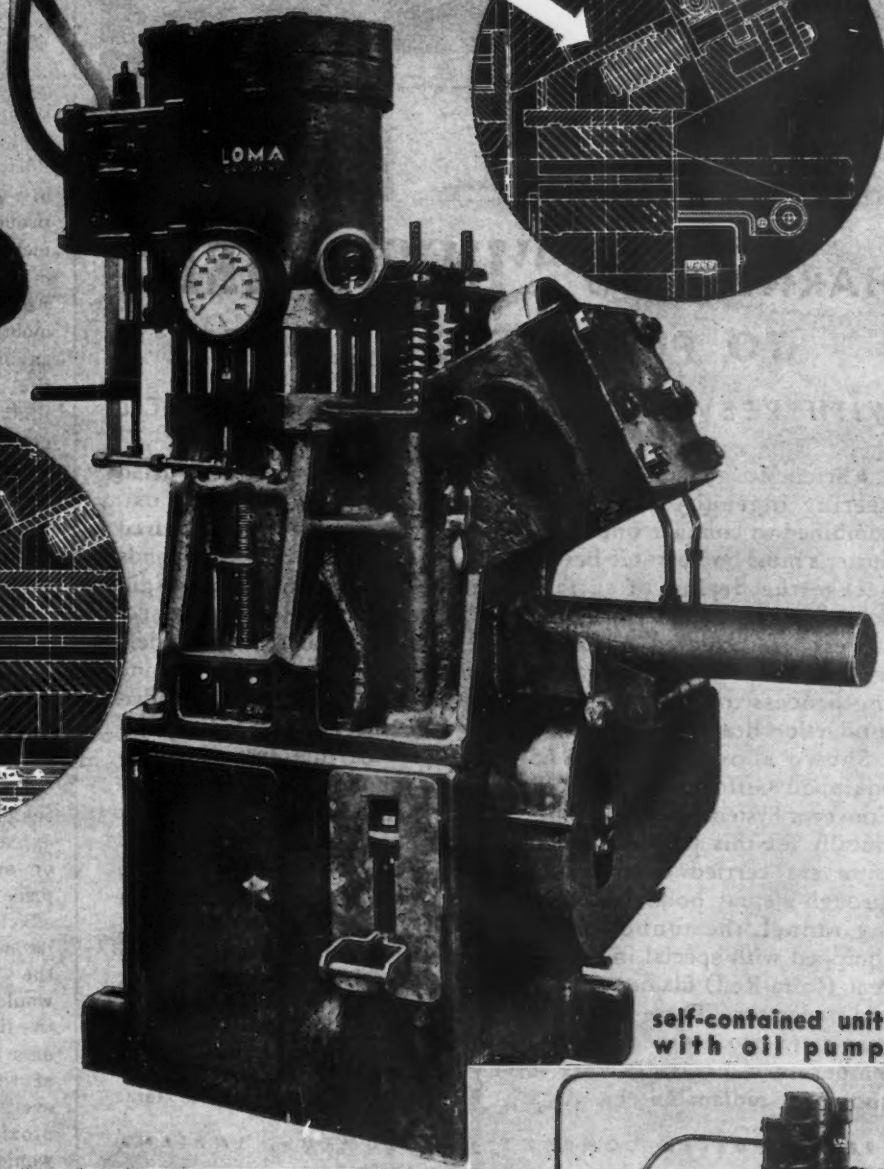


FOR A TEST BREAK



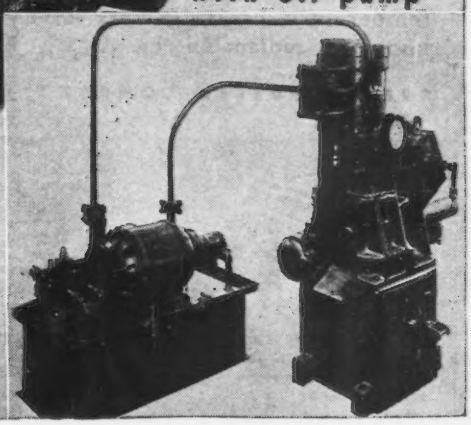






TOOL HOLDER
(shown for Test Breaks)
guided on all sides by adjustable wear plates

self-contained unit with oil pump



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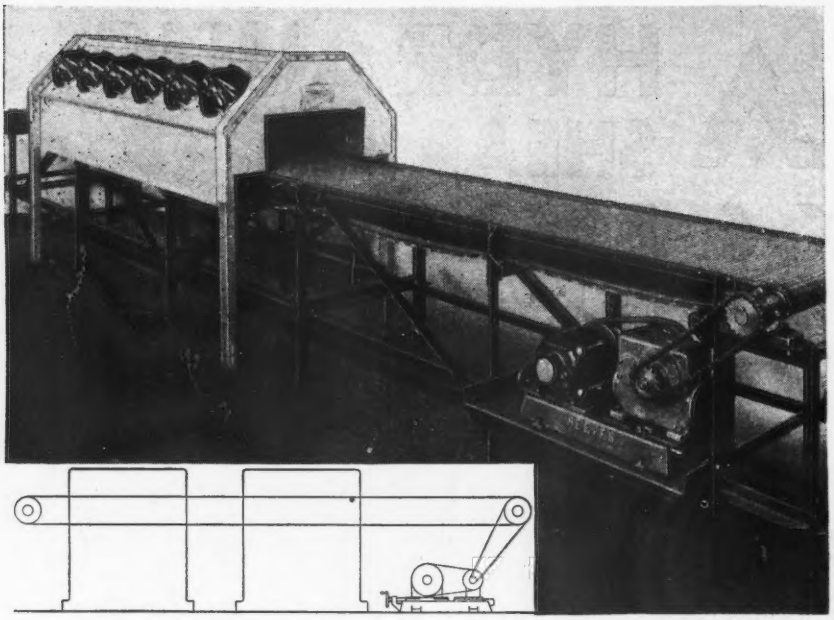
LOMA MACHINE MANUFACTURING CO., INC.
580 FIFTH AVENUE, NEW YORK, N. Y.



HARNESSING "INFRA-RED" TO PRODUCTION LINES

WITH REEVES VARIABLE SPEED CONTROL

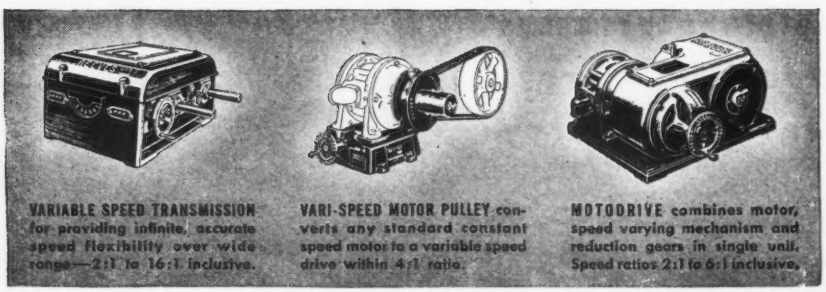
● Scientific genius and engineering ingenuity have again combined to conquer one of industry's most bothersome bottlenecks—the drying of surface coated metals. In this instance, success was achieved by adapting the "Near Infra-Red" drying process to continuous-flow production lines.

Shown above is a REEVES equipped Gifford-Wood N1-R Conveyor System, developed specifically for this purpose. Metal parts are carried continuously through a spray booth and baking tunnel, the tunnel being equipped with special incandescent (Infra-Red) filament lamps and reflectors. These heat the base metals to a predetermined temperature, creating what is known as radiant energy. As a result, surface finishes are dried and cured from the inside out.

Obviously, the time required for spraying and drying depends entirely on the size and weight of the parts being processed. And, because parts vary so widely in these respects, only infinite speed adjustability, as provided by REEVES Variable Speed Control, makes this system practicable for modern mass production methods.

REEVES Variable Speed Drives, for every conceivable type of production control, are easily installed on machines in service. Learn how the infinite speeds provided by REEVES Drives can importantly contribute to efficiency and economy in your plant. Write for catalog I-435 containing complete data.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA



VARIABLE SPEED TRANSMISSION for providing infinite, accurate speed flexibility over wide range—2:1 to 16:1 inclusive.

VARI-SPEED MOTOR PULLEY converts any standard constant speed motor to a variable speed drive within 4:1 ratio.

MOTODRIVE combines motor, speed varying mechanism and reduction gears in single unit. Speed ratios 2:1 to 6:1 inclusive.

Airing of Light Metal Future Sees Plenty Of Action at Hearings

Washington

• • • **The pessimistic,** or possibly realistic view of the future of the light metal industry was aired before the continuing hearings of the Senate Small Business Committee as representatives of the aircraft, railways, and automotive industries presented their views.

According to W. S. James, chief engineer of the Studebaker Corp., although there are practically no parts in an automobile that could not in theory be built of aluminum, because of the physical properties of the metal, their use is rather unlikely. For the automobile, the weight saving factor in the use of aluminum or magnesium, is outweighed by the need for certain physical properties. An all-aluminum auto, comparable in performance to present-day autos, would be much bulkier and would weigh almost as much as its steel and iron counterpart, not to mention costing considerably more to produce.

Henry J. Kaiser

Simple arithmetic, in past studies of the industry, has shown, Mr. James explained, that aluminum at 20c a lb., or even at the current record low price of 15c. a lb., cannot compete effectively with steel or iron despite its weight advantage. He thought the manufacturers of motor cars would hardly be lured into the use of the lighter metals on the basis merely of a temporary reduction in the price of those metals. He did say, however, that a price of 7½c. a lb., approximately three times that of steel, would encourage the use of aluminum wherever its physical properties would permit taking full advantage of its weight saving.

In behalf of the industries bearing his name, Henry J. Kaiser described the light metal possibilities in the shipbuilding field, recalling the design for an all aluminum destroyer which was ready before Pearl Harbor, deferred only because of the urgent need for the light metal for aircraft,

PHILCO

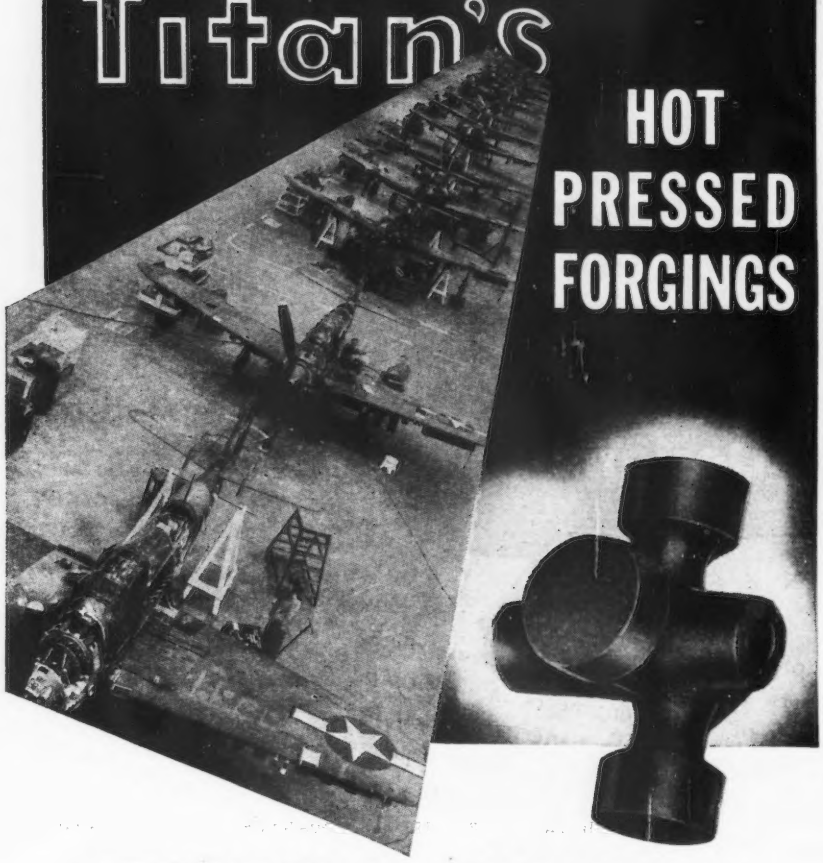
gives you the latest in Modern Battery Design!

THOUSANDS of electric industrial trucks are now getting more work done at lower cost because of the advanced research of Philco engineers in developing tougher, more powerful storage batteries. Philco has long led in providing batteries of maximum capacity, with the rugged long-life construction especially engineered for today's heavier work schedules.

Now Philco engineering leadership is demonstrated anew with the storage battery that gives 30% longer life —the great new Philco "Thirty"! For lower cost in handling materials with electric trucks, be sure to include the new Philco "Thirty" in your plans. Now available in preferred types. Complete information gladly sent on request. PHILCO CORPORATION, *Storage Battery Division*, Trenton 7, New Jersey.

For 50 years a leader in Industrial Storage Battery Development

The new Philco "Thirty" with 30% longer life is identified by its distinctive red connectors.



ARE USED IN AMERICA'S WAR PRODUCTION

TITAN'S HOT PRESSED PARTS are being used in huge quantities in many types of war materiel needed for victory. Our entire output of Hot Pressed Parts is allocated to meet the diversified requirements of our armed services.

While we have kept pace with the fast-moving developments that have been responsible for America's superiority in armament, peace will find Titan Hot Pressed Parts readily adaptable for use in new and improved products. They will help meet post-war competition on every count of quality, production, engineering and cost.

titan

METAL MANUFACTURING CO., BELLEFONTE, PA.

NEW YORK • CHICAGO • NEW ORLEANS • SAN FRANCISCO

Quality Alloys By Brass Specialists

Brass and Bronze Rod • Forgings • Die Castings • Welding Rods

which was planned to do 60 knots. He also expressed in the enthusiastic Kaiser fashion, the possibility of using either aluminum or magnesium for the superstructures of passenger vessels. Truck and bus bodies, and terminal shipping facilities, were also mentioned as possibilities for light metal markets.

Vice-Chairman Eugene E. Wilson of United Aircraft Corp., who spoke as president of the Aeronautical Chamber of Commerce described the dependence of the aircraft industry upon military developmental work. The need of the aircraft industry for this business to survive is matched, however, by the nation's need for this continuation of air power, according to the report of Gen. H. H. Arnold, which was quoted by Wilson in testimony as follows:

"Even an up-to-date air force in being may not constitute air power. Preeminence in the air implies maximum ability to maintain and expand existing establishments. There must be a strong and healthy aviation industry, building thoroughly modern aircraft and equipment, and developing, testing, and experimenting with advanced designs for tomorrow. Segments of industry must be capable of and ready for rapid conversion to quantity production, and certain Government-owned plants and production equipment not subject to rapid obsolescence should be kept in stand-by as a war reserve against the potential aggressor.

"The importance of a progressive aviation industry cannot be overstated. One way to keep it progressive after final victory is promptly to sell, salvage, or scrap excess or obsolete planes so that they will not hang over the Air Force and the aviation industry retarding development."

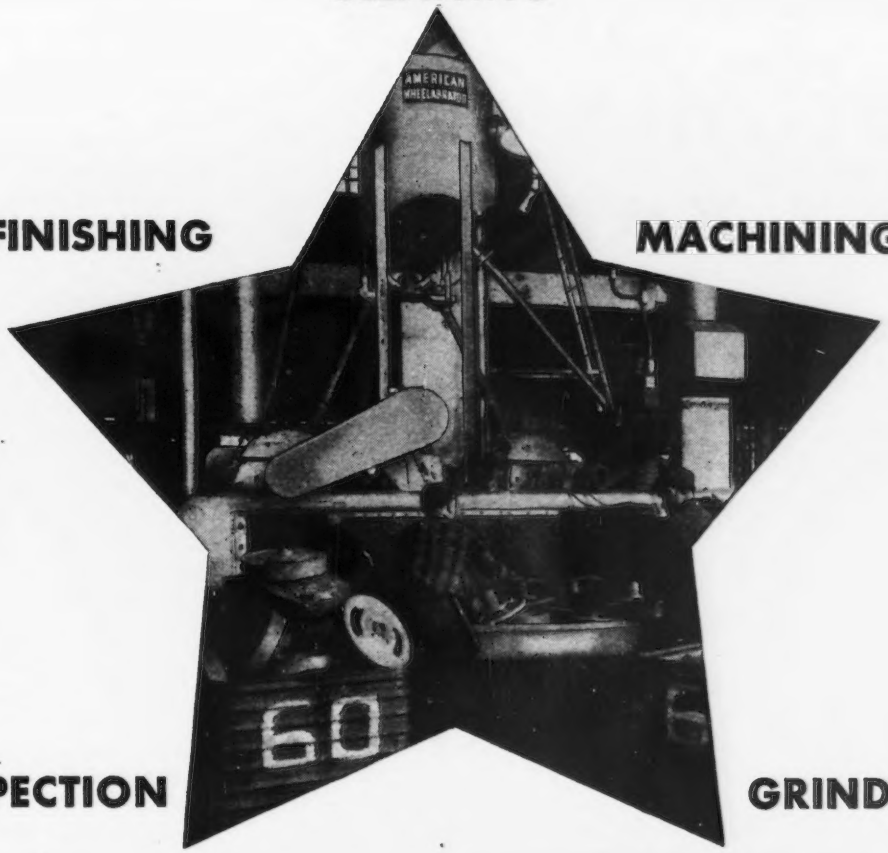
"Accomplishment of these goals described by Gen. Arnold," declared Wilson, "Obviously requires the inauguration of an orderly and carefully-planned procurement and development program that will assure the Army and Navy air services of a requisite supply of latest model aerial weapons."

He said in summary that the opportunity for the continued utilization of the light metals by the aircraft industry appears to be truly promising, for (1) barring radically new developments in the laboratories, aircraft of the future will continue to be fabricated largely from light metals, and (2) some members of the industry will apply their manufacturing

CLEANING

FINISHING

MACHINING



INSPECTION

GRINDING

Wheelabrator STARS ON 5 points

Aside from giving you peak performance in your cleaning department Wheelabrator stars on four other points because it removes all trace of scale and sand down to the virgin metal. The result is that Wheelabrated products are bright, silvery and uniformly clean. Thus an ideal surface is provided for final finishing such as enameling, plating, galvanizing and painting.

The machining department also benefits, as the clean metal machines easier and quicker and cutting tools last longer.

The thoroughly cleaned product is easier to inspect, and accuracy in hardness readings is assured. Consequently, few parts get through to the customer to cause trouble. Your products when cleaned with a Wheelabrator have no chipped or rounded corners and only a minimum of stock need be allowed for grinding or machining. As Wheelabrator steps up cleaning speed it also cuts cleaning costs to the point that the machine pays for itself in from six months to two years. Check up now and see how Wheelabrator can star on five points in your production.

TUMBLASTS

Made in seven sizes from 1 cu. ft. to 30 cu. ft. capacity for cleaning work that can be tumbled.

TABLES

Made in Plain table and Multi-rotary table types for cleaning flat or fragile work that cannot be tumbled.

STEEL CABINETS

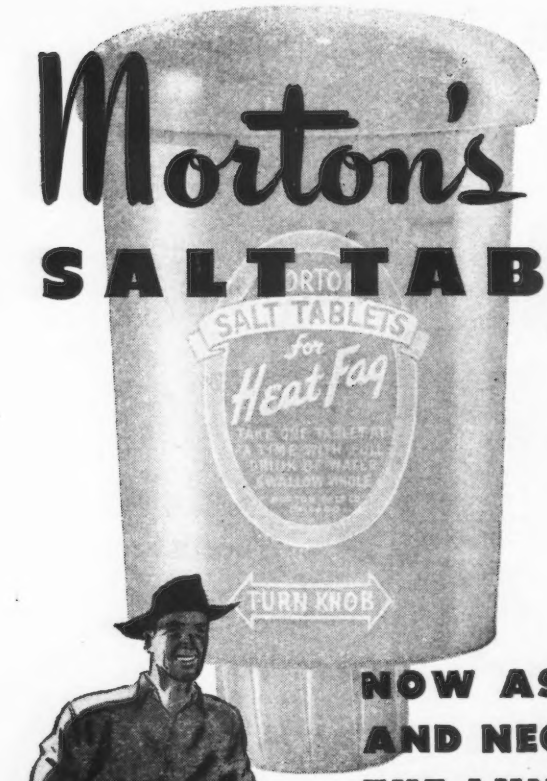
Cabinets are designed for special production requirements or where the work cannot be adapted to a standard machine.

WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT

American FOUNDRY EQUIPMENT CO.

510 SOUTH BYRKIT ST.
MISHAWAKA, IND

Morton's SALT TABLETS



NOW AS FAMILIAR AND NECESSARY AS THE LUNCH PAIL . . .

It's the exceptional industrial plant that fails to provide salt tablets for its employees. Only a few years ago it was otherwise. Salt Tablets have become an industrial "must" for men who work — and sweat.

Sweat robs the body of vital salt. This throws the body fluids out of balance. The result is Heat-Fag, inalertness, accidents, heat prostrations. The preventive is salt and water — water to restore the moisture lost in sweat, salt to restore the saline balance. Water alone won't do it. Both are needed.

The easy, simple, sanitary way to provide salt to workers who sweat is Morton's Salt Tablets available at every drinking fountain. The cost is less than a cent a man per week.

In salt tablets, as with other grades and types of salt, Morton is the recognized leader. Order Morton's Salt Tablets and Dispensers from your distributor or directly from this advertisement. Write for free folder. Morton Salt Company, 310 S. Michigan Avenue, Chicago 4, Illinois.

MORTON'S DISPENSERS

They deliver salt tablets, one at a time, quickly, cleanly—no waste. Sanitary, easily filled, durable.

800 Tablet size - - - $3.25

MORTON'S SALT TABLETS

Morton's Salt Tablets are available either plain or with dextrose.

Case of 9,000, 10-grain salt tablets - - - - - - - $2.60

Salt Dextrose Tablets, case of 9,000 - - - - - - $3.15

MORTON'S SALT TABLETS

"know-how" in the light metal field to the development of new consumer products—if financial conditions permit.

Freight cars of aluminum, particularly gondola and hopper cars, were described as one of the best potential markets for aluminum after the war by Charles D. Young, deputy director of the Office of Defense Transportation. The corrosion resistant factor was emphasized by Young, contrasting experimental aluminum cars to steel in this respect.

Charles D. Young

He pointed out that of an annual construction average of 41,000 cars, over half of these were of the gondola or hopper type, and that it might be assumed that a third of them might be made of part aluminum or possibly magnesium.

Accessory use of aluminum on both cars and locomotives was also predicted by the ODT official, as the weight limitations of axle loads become important.

The railroads own research work and operating experience with the use of aluminum equipment was outlined by V. R. Hawthorne, executive vice-chairman of the mechanical division of the Association of American Railroad.

According to his statement a considerable number of suburban passenger cars constructed of aluminum alloys have been in service for a number of years—the oldest cars having had approximately 22 years' service. A few hopper cars constructed entirely of aluminum alloys have been in service approximately 10 years, and a considerable number of tank cars constructed of aluminum alloys have been in service during the last 10 years, although a small number of aluminum tank cars have been in service approximately 20 years. Aluminum alloys have also been extensively used for parts of passenger cars, such as roofs, interior trim, bulkheads, etc., where the car structure is of steel construction. A number of railroads have also been using aluminum alloy locomotive cabs for keeping the total weights of locomotives within practical operating limits. Some experiments have also been conducted with the use of aluminum alloys for locomotive side rods, locomotive boiler

THE 3-C's OF RUST PREVENTION

1 Clean Surfaces.

2 Careful Choice of Preventive.

3 Correct Application.

Preventing corrosion includes far more than mere application of a preventive compound—even if the preventive is specified for the job. No matter if it is most carefully applied, it cannot do valiant guard duty against infiltration of rust unless the metal surface is clean.

Houghton's Rust Prevention Service begins at the beginning. It covers the three major points listed above. It includes also protection of parts passing through production before they are finally packaged.

This service, begun three wars ago, has kept ahead of current demands made increasingly stringent by this global war. May we sit in on your plant's discussion of corrosion problems? We believe we can help.

Write for the latest revision of the 80-page book on "RUST—Causes and Prevention".

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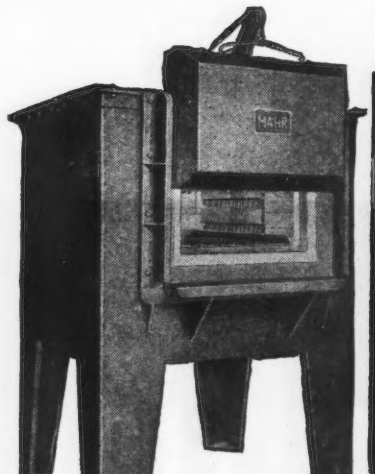
Houghton's

RUST PREVENTION SERVICE



1. Hardening carbon and alloy steels below 2000°F
2. Tempering or drawing heat treated parts
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4. Pre-heating high speed steels.
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ALL THESE USES FOR

MAHR BOX TYPE Electric FURNACES

Let's look first at the heart of the furnace — the heating elements. MAHR ELEMENTS are specially designed by us for fast heat up and maintenance of uniform temperature. They are 80% nickel and 20% chrome with a watt density of not over 10 watts per square inch. Mounted where they are easily replaceable. TERMINALS have three times the cross sectional area of the resistors, and are securely clamped to solderless connectors within a ventilated housing.

Without "dressing it up" with excess gadgets, we've put into this MAHR Electric Furnace everything necessary to meet the most rigid durability and performance requirements. SHELL is reinforced steel plate, and carefully insulated for low current consumption. The DOOR needs no sand seal because it's wedged on all sides. HEARTH PLATE is cast nickel-chrome alloy with upturned flanges. For sizes and specifications, write for our data chart.

Electric POT Furnace

Suitable for all molten bath heat treating operations. Can be operated continuously at 1650° F. Elements easily replaced. Thoroughly insulated. Easy operating two-piece door with handle in each piece.

WRITE for BULLETINS on Other MAHR PRODUCTS

Electric gas and oil fired ovens and furnaces in car bottom, conveyor and other types for every heat treating operation. Safety Vacuum Torches, Rivet Heaters, Forging Furnaces, Burners, Heaters, Blowers, Fans.

Complete Engineering Service

MAHR
ENGINEERS • DESIGNERS • MANUFACTURERS
ALL EQUIPMENT FOR METAL HEATING

MAHR MANUFACTURING CO.
DIVISION OF DIAMOND IRON WORKS, INC.
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jackets and other items of locomotive construction.

Several complete high-speed streamline passenger trains have been constructed of aluminum alloy and also of stainless steel, and many coaches, dining cars and other passenger train cars are in daily service which are constructed of these metals or low alloy high tensile steel. None of this equipment has yet been in service a sufficient length of time to develop its ultimate useful life in comparison with previous conventional equipment.

According to Hawthorne's testimony aluminum is a reliable material. Structurally the physical characteristics of the metal run uniform and are well known to designers. The cost of cars built of aluminum alloys is higher than for similar cars constructed of low alloy or plain carbon steel because of the higher average metal cost. It is possible that experience will prove that much of this penalty in first cost may be made up by savings in operating costs due to reduction in weight of cars, especially passenger train cars, and also due to the fact that with the same motive power higher scheduled speeds may be made over certain territories because of lighter train weight.

At the present time, two lots of freight cars constructed of aluminum alloy are being built—one lot consists of 25 hopper cars being built by the Missouri Pacific Railroad and the other consists of 30 box cars, 10 each being built for the Chicago and Alton Railroad, Minneapolis and St. Louis Railway and Rock Island Lines.

Before railroads can generally justify recommending that large numbers of freight cars be constructed of aluminum alloys, it seems necessary that the price of this material be reduced. "It is to be hoped," he continued, "that the producers of the high-priced light metals will find means to materially reduce the price of their product. If this is accomplished, there can be no doubt that the railroads will use these light metals in the construction of new equipment and the rebuilding and heavy repairing of existing equipment where practicable."

Much will also depend upon the final result of the study to evaluate light weight in freight car equipment.

"Magnesium has never been used to any extent by the railroads and not at all for equipment construction. From our limited knowledge of this metal, it seems very doubtful that it

Jonesy Learns about Genex C

JONESY, our welding super, was sitting as pretty as any guy with a mug like his can sit. No beefs from the customers; no screams from the Lords of Creation in the front office. Our jobs were mostly downhand, "hot-rod" stuff, calling for Murex F or FHP electrodes. In fact, call for anything other than Murex on those jobs, and Jonesy would roar like a bull.

Then in comes this new job, #2XW31. I'm Jonesy's assistant; we gave the drawings and specs a careful once-over. To me it looked like a job for Genex C.

"Right much carbon in that steel," I mentioned. "Calls for a colder arc than the run of our jobs here, so we won't pick up lots of carbon and get a brittle weld. I'd say we want a 6012 electrode. Okay?"

"Okay," Jonesy agreed, and I picked up the phone and put in a call for Murex.

"Hey," Jonesy yelled, "Nix." He grabbed the phone out of my hand. "Look," he roared, "Murex may make the best downhand hot rods money can buy, but I don't know about their others. Call some other outfit."

I argued as long as you can with a boss like Jonesy. I tried to tell him that Murex has two of the best 6012 rods made (Genex and Genex C)—plus about 30 other electrodes, each one as good in its place as their famous hot rods. No soap, though; Jonesy knew better.

So I called up some other outfit—several in fact—and we tried their 6012 rods. Unit after unit of Job #2XW31 came off the jigs cracked in the weld. Too much heat and pickup of carbon. Jonesy raved for a week, then finally broke down.

"Say," he asked me, sort of sheepish, "how about calling Murex?"

I called Murex and they sent us a batch of their Genex C. Job #2XW31 was off the floor in two days—and no job's licked us since, thanks to Murex.

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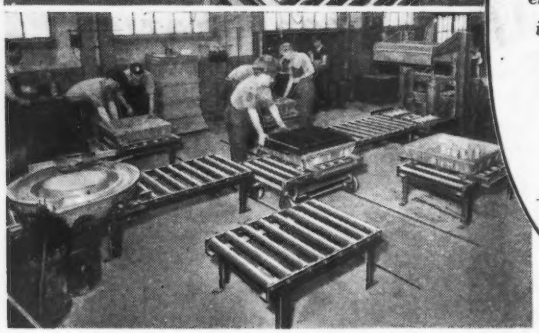
P. S. I've since found a simpler way to put lads like Jonesy wise as to the score on Murex. You just send for the new, big Murex wall chart and tack it up over his desk. The chart divides Murex electrodes as to use on mild, low-alloy, stainless and hard-surfaced steels; also shows at a glance the AWS-ASTM grade, polarity, current, etc. of each electrode. No arc-welding department should be without one. Just drop a line to Metal & Thermit Corp., 120 Broadway, New York 5, N. Y. No charge or obligation.

MUREX
Electrodes



Molding, pouring and shakeout operations served by Logan Conveyors in a large mid-western magnesium foundry. Logan engineering provides flexibility in both handling and storage and offers definite advantages that pay off in increased efficiency and time and labor savings.

Conveyor Systems Must Be ENGINEERED to Eliminate Waste Motion, Back-Tracking and Unnecessary Handling

The manpower shortage makes it doubly important to cut down on waste motion and unnecessary handling in any manufacturing process. Logan designed conveyor systems are in operation throughout the nation's war plants, saving thousands of manhours every day and speeding the flow of production. Write for the Logan Catalog today. Logan Co., Inc., 545 Cabel Street, Louisville 6, Kentucky.

Logan Conveyors

PUT *FLOW* INTO PRODUCTION

will be very seriously considered for the construction of post war railroad equipment," was Hawthorne's summary of that metal.

W. E. Bettendorf, president of the Bettendorf Co., railroad accessory manufacturers, A. W. Scarratt, vice-president for engineering and patents of the International Harvester Co., and J. S. Laird, Chemical Engineering, Ford Motor Co., also presented testimony to the committee. The hearings are scheduled to continue through the month of March.

Pehrson Sees Shift Of Ore Production To Eastern States

New York

• • • **The relatively more favorable reserve** position of iron ore in the northeastern and southeastern regions of the United States should bring forth a somewhat larger proportion of production from those areas, according to Elmer W. Pehrson, chief of Economics and Statistics Branch, U. S. Bureau of Mines, who addressed a meeting of the American Institute of Mining and Metallurgical Engineers here recently. Mr. Pehrson based his prediction on the fact that the proportion of commercial iron ore reserves in the Lake Superior District is considerably less than its share in current production schedules.

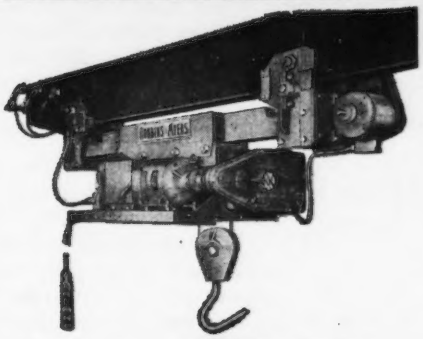
Mr. Pehrson added, "the United States is well supplied with iron ore, although the reserves do not match those of coal by a wide margin. It is estimated by Ernest F. Burchard of the Geological Survey and Albin C. Johnson of the Bureau of Mines, that the reserves of iron ore of present commercial or usable grade total 5478 million long tons, of which about a third is classed as inferred ore. Total production through 1943 was 2613 million tons so that 68 per cent of the original reserve, based on present estimates, still remains. Opinions differ as to the price at which this ore is available but it is believed that it can safely be assumed that virtually all of it could be mined at prices that have prevailed in the past or at moderately higher prices. In addition to this commercial reserve there is a potential reserve of 63 billion tons of submarginal ore, the utilization of which will depend on technologic advances and economic conditions.

"The concentration of iron ore consumption in the states bordering the Great Lakes may be expected to con-

It's *SPEED* you want in Hoists

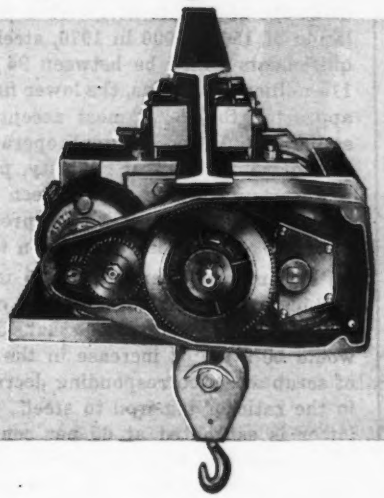
SPEED in Lifting

This 3 H.P. Type F1 Robbins & Myers electric hoist handles loads up to 2000 lbs. at the rapid hoisting speed of 42 feet per minute. Speeds like this call for *stamina* and *strength*—for design and construction like the R & M safety frame of sturdy welded steel, heat-treated alloy gears and shafts, heavy-duty anti-friction bearings throughout, and an always-dependable suspension.



SPEED in Travel

Trolley-type F1 hoists for manual traverse move on easy-rolling ball-bearing wheels, but where obstructions make floor propulsion difficult these hoists may be equipped for single or variable speed power travel. A double-swivel-truck, motor-driven trolley for fast operation on long track with sharp curves is shown. It is push-button controlled for travel speeds from 150 to 175 f.p.m.



SPEED in Servicing

Extreme simplicity of R & M design is indicated by the convenient accessibility of driving elements. Removing the gear case cover exposes entire mechanism for inspection or withdrawal. Users report the automatic load brake requires no adjustment for *years* at a time; that world-famous Robbins & Myers hoist motors are *marvels* of durability; that fine engineering is *real* economy.

Simple, clean-cut, functional design—that's what users like about R & M hoists and cranes . . . *that* and the profit-earning performance *fast operating speed* makes possible. There are *hundreds* of models of these serviceable, versatile units. All require an unusually small amount of headroom. All are products of precision manufacture . . . built to the same sound fundamentals. Bulletin No. 801 describes the Type F hoist. Ask us for it.

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Cleveland...470 Rockefeller Bldg.	Pittsburgh....H. W. Oliver Bldg.
Dallas.....1100 Cadiz St.	Providence.....44 Clifford St.
Denver.....1420 16th St.	San Francisco, 116 New Mtgmry St.
Detroit... 7376 Grand River Ave.	Seattle.....216 Walker Bldg.
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Are you tying up too much capital in single-purpose machines?
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Is your fixed overhead on machine tools too high?

Make sure you don't put your post-war retooling investment into "white elephants"...

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You maintain volume and quality... with big savings—yet stay adaptable to the uncertainties that lie ahead

Delta's conception of tool design provides you with a safe, flexible approach to post-war retooling. It eliminates the necessity for tying up heavy capital in costly, cumbersome, special machines of limited usefulness that are slow to build and that may become obsolete with the next change in product design.

By adopting this modern tooling practice — proven sound in war production, you can build high-production machines to do specific jobs, using low-cost, stock model Delta elements which are readily convertible when requirements change.

You can salvage your present machines which are approaching obsolescence, by replacing worn units with standard Delta components.

And, by taking advantage of the portability and compactness of Delta machines, you can quickly revise production line layouts to get increased man-hour output.

Low-cost Delta units and the ingenuity of your engineers form a workable combination to solve your production problems. Delta's savings in cost, weight, and space are not made at the expense of quality, but are due to advanced design and modern production methods applied to a large volume of standard models.

Cut your investment risk in post-war retooling. Save money . . . stay adaptable — with Delta-Milwaukee Machine Tools, in units, batteries, and special set-ups.

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Delta's 76-page Blue Book

provides 140 case histories of valuable war production experience that may suggest similar money-saving peacetime applications in your plant. Also available is a catalog of low-cost Delta-Milwaukee Machine Tools. Request both, using coupon below.

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An example of the flexibility and wide application of standard Delta parts is this special Delta Drill Press set-up, for extremely accurate slicing of thin wafers of quartz crystals used in communications instruments. A Delta 14" drill press head — to which an abrasive wheel is attached — is pivot-mounted on its side and power fed by a hydraulic cylinder. A Delta compound slide rest on the base of the drill press allows the entire table to be moved in two directions so that the crystal can be placed to get the proper cut.

tinue with minor modifications for many years. The steel industry in this region is soundly based on the proximity of coal and iron ore and a tremendous consuming industry has been built around it. Further development of northeastern iron ores will cause little if any change in the geography of steel production. Moderate expansion on the seaboard seems probable. The expansion that may result from the favorable reserve position of the southeastern states and the postwar operation of the new plants in the west will have only limited effects on the present pattern of steel production. The situation in the more distant future will depend on national policies which probably will be determined by the success achieved in developing the low grade ores of Minnesota. It seems probable that the huge iron ore resources of that region will continue to be the outstanding source of iron ore for the steel industry of the United States.

"Forecasts to 1970 are based on an analysis of the probable demand for steel, assuming that per capita consumption in 1970 might lay between 0.60 and 0.73 short tons. These represent increases of approximately 25 and 50 per cent over the pre-depression rate of 0.48 tons. With a population of 156,549,000 in 1970, steel requirements would be between 94 and 115 million short tons, the lower figure appearing to be the most acceptable estimate. At the normal operating rate of 75 per cent of capacity, plant requirements would be between 125 and 150 million tons. The present installed capacity is 93.5 million tons.

"Pig iron requirements of 55 to 66 million gross tons in 1970 are computed on the assumption that there would be a slight increase in the use of scrap and a corresponding decrease in the ratio of pig iron to steel. The latter is estimated at 65 per cent in 1970 compared with 68 per cent during the past decade. On this basis pig iron requirements in 1970 would be between 61 and 74.5 million short tons. The present capacity is 67.5 million tons according to the American Iron and Steel Institute.

"During the past 10 years the ratio of iron ore production to pig iron production has been 1.72 to 1. Assuming this ratio will continue and that imports will remain at the same proportion as in the past, the iron ore requirements in 1970 total between 95 and 115 million long tons. Maximum production to date was 105,526,000 tons in 1942.

"While the total iron ore reserves

TAPE CUTS COSTS

And FILMONIZE Self-Sealing Tapes cut them *even more*. Why? Because FILMONIZE works faster. It strips off the roll more easily—has no annoying "curl back," no tangle, no waste—and it seals instantly without water.

Some of the biggest industrial plants in the nation use it—and tell us of the many ways it saves money for them. Why not put it to work for you?

Your local distributor will gladly show you the whole FILMONIZE line: Transparent Tapes, Colored and Multi-Colored Tapes, Printed Tapes, Riveting Tapes, Identifying Tapes, Splicing Tapes, Acetate Fibre Tapes, Metal Tapes, Specialty Tapes, Packaging Tapes. All in widths of ½" to 18".

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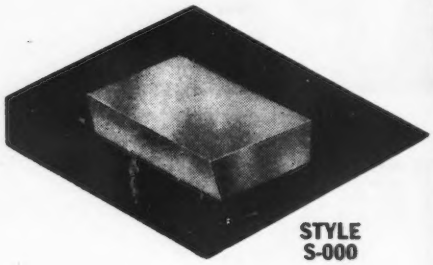
INTERNATIONAL PLASTIC CORPORATION

MORRISTOWN NEW JERSEY

New KENNAMETAL *"Universal"* BLANKS



STYLE S-000

FACILITATE TOOL MAKING *and Keep Stocks Down*

These new Kennametal "Universal" tool blanks are literally "jacks-of-all-trades." Rectangular in shape, with 12° clearance angle formed on one long edge, they can be used to make many different types of tools, simply by setting them into open-end recesses, as illustrated. They are available in all recognized standard sizes, many of which are stocked in several grades.

Their use reduces inventory investment, and simplifies stock room problems. And, above all, they make it easier for you to employ on a widespread, yet economical scale, the advantages of Kennametal — its ability to cut metal, including steel up to 550 Brinell hardness, accurately, at greatly increased speed, with amazing tool life.

Catalog particulars, and prices, are yours for the asking.

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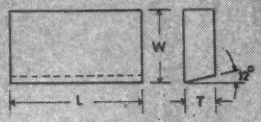
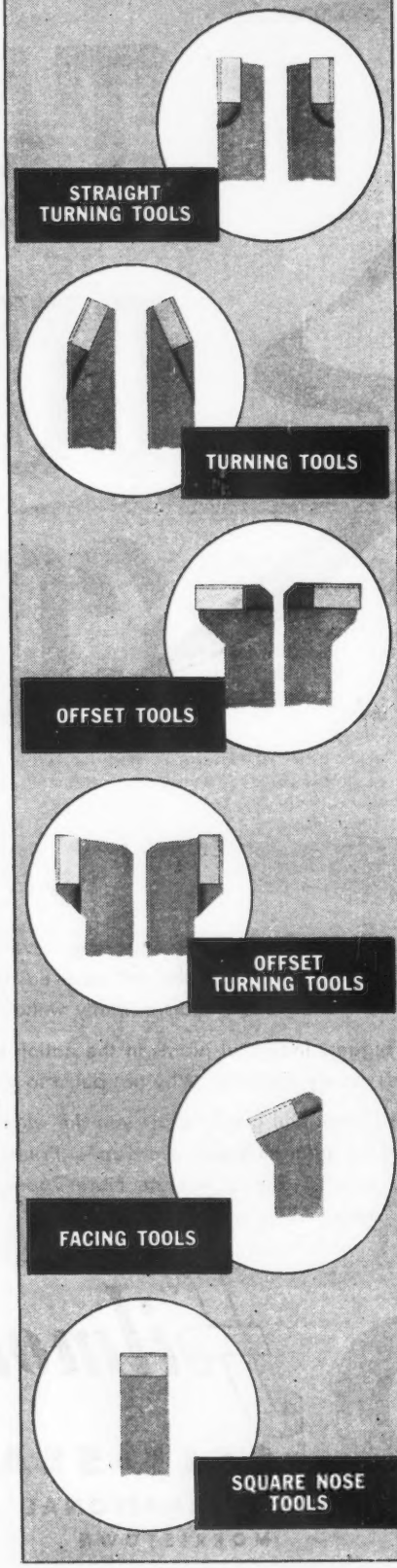
SUPERIOR CEMENTED CARBIDES
KENNAMETAL Inc., LATROBE, PA.

ONE STYLE TOOL BLANK



FOR ALL THESE JOBS . . .



appear to be ample to meet domestic requirements for a prolonged period, we shall soon be confronted with a major problem because of the exhaustion of the direct shipping ores of the Lake Superior District, found chiefly in the Mesabi Range. This ore represents the cream of our resources because the deposits can be mined cheaply and the ore used directly in the blast furnace without prior treatment. Direct shipping ores of Minnesota account for 50 per cent of the total production of the country. At the 1942 rate of extraction the remaining tonnage represents only 17 years' life, and the rate of production will begin to decline in the near future. The problem is made more acute because 90 per cent of the production of these high grade Minnesota ores comes from the open pit mines that contain only 57 per cent of the reserves. Exhaustion of these mines is therefore imminent. Declining rates of production at the open pit mines can be offset only in part and for only a few years by increasing the output of direct shipping ore from underground mines and concentrates. The total estimated reserves of commercial grade ore in the Lake Superior District is equivalent to less than 25 years' life at current rates of production. It is therefore obvious that if the district is to continue to supply large tonnages, development of the low grade ores must be started in the near future.

"The open pit mines provide great flexibility in production because mining can be stopped completely if necessary with low maintenance costs and little adverse effect on production capacity, and it can be increased quickly in periods of heavy demand. During the present war this resource has been of inestimable value in making possible our enormous steel output. The impending loss of this facility is thus a matter of major national interest because it has served as a gigantic stockpile which has supplied the needs of the nation in times of heavy demand and national emergencies. If we are to become dependent on our lower grade ores we shall have to build large plants to treat them. Such plants provide rigid limits on production capacity and if surplus capacity is maintained to meet peak demand, depreciation and obsolescence on a large scale will have to be reckoned with.

"Failure to develop the low grade ores of the Lake Superior District eventually would lead to dependence on foreign sources of supply. In view

How OHIO FERRO-ALLOYS CORP. HELPS IRON AND STEEL PRODUCERS

TOP METALLURGICAL STANDARDS IN ELECTRIC-FURNACE PRODUCED FERRO ALLOYS

Strategic plant locations in the East and West plus the most modern and efficient operation practices assure service and quality beyond the usual. Ohio Ferro has always more than kept pace with the high standards desired by consumers and is always ready to meet exacting requirements.

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New or improved ferro-alloy products are under continuous development and test—both in the laboratory and in production. Research by the Ohio Ferro-Alloys has always been a growing activity and every new research gives rise to new lines for development. Improvements result that benefit the industry as a whole.

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When consultation on problems of iron and steel production is desirable you can count on assistance from one of Ohio Ferro's experienced staff. These men are technically able, through metallurgical and wide production experience, to advise on the use of ferro-alloys.

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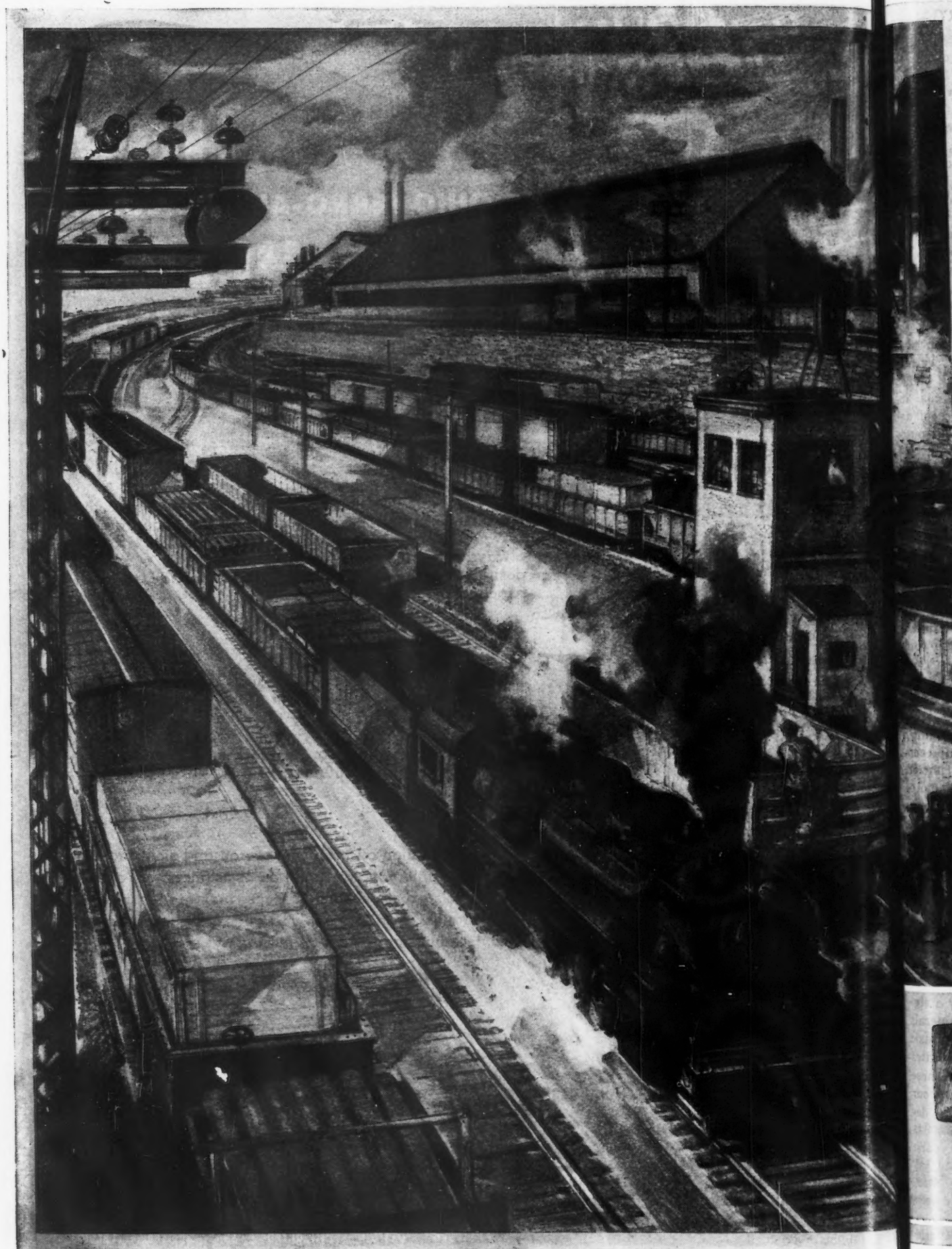

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MIGHTY STEEL TIDE FLOWS ON THE RAILS

Transporting the many millions of tons a year of raw materials, supplies and equipment — iron ore, coal, coke, limestone, lumber, brick, sand, cement, machinery — to keep steel production at capacity, and distributing more than 60 million tons of steel products annually to the world of war and industry is a tremendous undertaking.

The railroaders by their magnificent, on-the-minute handling of millions of tons of raw materials and finished products are keeping the mighty tide of steel flowing full for the use of our fighting forces in the achievement of victory.

With the coming of peace, the railroads will once more take up their normal task of distributing for civilian use the multitude of steel products — many of them new and better — which will again bring comfort, convenience, and a fuller life for all.

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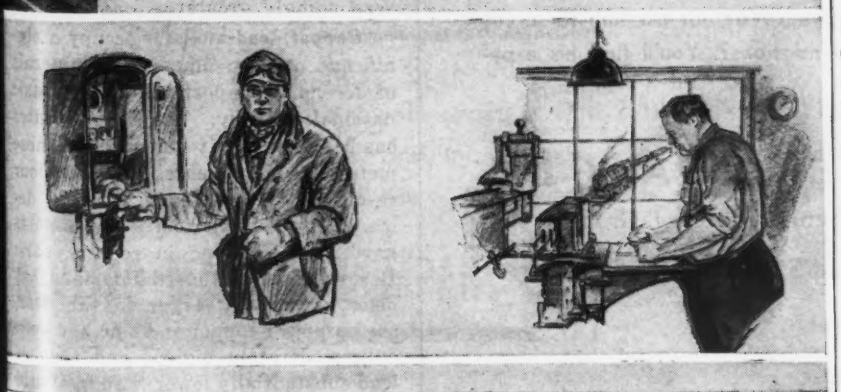
CONTROLLED QUALITY STEEL FOR WAR AND PEACE

J&L STEEL



FROM AN ORIGINAL DRAWING AND SKETCHES MADE AT J & L ALIQUIPPA WORKS BY ORISON MACPHERSON

RAILROADS

To wait 3 months for a freight to pass, running at 30 miles an hour, is what you would have to do at any grade crossing if all the freight cars serving the nation's steel industry during 1944 were hooked up into one single freight train on that particular railroad. And, if you tried to count the cars in the train, you would be all worn out weeks before the little red caboose behind the 6½ million freight cars came in sight.

Chow train 3,000 miles long—extending from Los Angeles to New York — would represent food transportation job done for Army and Navy last year by American railroads—nearly 11 million tons of food, 364,000 cars.

Snowy mountains, steamy jungles are among transportation obstacles being overcome by Army's railroad men in uniform. Military Railway Branch of Transportation Corps delivers the goods—and men—where and when they are needed—often under fire.

One mile of boiler tubing is the surprising total contained by average road locomotive in service on U. S. railroads. This type of tubing is one of the products of J&L's tube mills at Aliquippa and Oil City, Pa.

More than 40,000 trains, freight and passenger, operate daily throughout U. S.

"Stop trains with wind? Ridiculous idea!" was scornful greeting George Westinghouse, Pittsburgh inventor in his early twenties, encountered from railroad men when he sought favorable attention for his crude automatic air-brake (Patented Apr. 13, 1869).

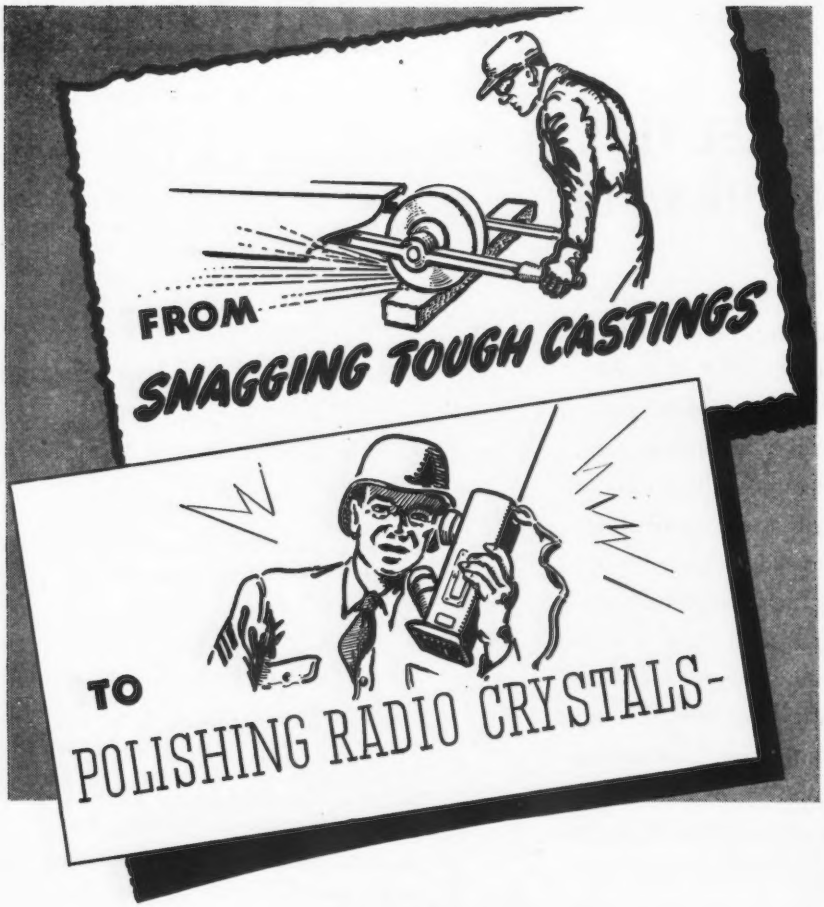
First railroad tunnel in United States was bored 900 feet through crest of Allegheny Mountain at Portage, Pa., more than 100 years ago for canal boats plying by rail and water between Philadelphia and Pittsburgh.

"Hook-headed" spike used today by railroads to fasten steel rails to cross ties was originally designed about 1830 by Robert L. Stevens, then President of Camden and South Amboy Railroad in New Jersey. Stevens at same time designed the "T" type rail used today by railroads all over world.

Ibex, Colorado, on the Denver & Rio Grande Western Railroad, is highest point reached by standard steam railroad in this country, 11,522 feet above sea level.

Prolonging life of railroad ties are countless J&L-made "tie-plates"; steel plates installed between rails and ties to provide a firm foundation for rails and prevent cutting of ties under heavy impact of trains.

Red Indians, not red points, were the great problem when famous scout William F. Cody signed contract to supply buffalo meat to Union Pacific Railroad construction workers, thus acquiring his title of "Buffalo Bill."



THERE'S A LIONITE ABRASIVE TO FIT THE JOB !

LIONITE Abrasive Grains are available in all grades of toughness and in all sizes from 7 micron optical flours up to ½ inch abrasive chips for tumbling barrels. Whether your operation is grinding, polishing, tumbling or blasting, you'll find exactly the abrasive you need in LIONITE.

Users report sharp increases in production and improvement in finish when they use the correct grade and size of LIONITE, as recommended by the LIONITE representative. Why not ask him to survey your operation and submit recommendations? You'll find his experience valuable.

GENERAL ABRASIVE COMPANY, INC.

Lionite and Carbonite Abrasive Grains

NIAGARA FALLS, N. Y., U. S. A.

of the large tonnages required, the maintenance of shipments from foreign sources in time of war would present a major problem of national defense. Because of this and the high essentiality of steel in war, it would seem unwise for the United States to allow its self-sufficiency in iron ore to fall to dangerous limits. Presumably to maintain our present position would justify some extra cost to the public, but the consumer cannot be expected to assume an unreasonable burden on this account.

"The United States is fortunate in having the largest reserve in the world, but the tremendous contribution of coal to the nation's welfare is too little appreciated by the public, which is prone to regard the coal industry as an occasional source of annoying labor-management disputes and disagreeable fuel shortages. We have no serious difficulties of supply in sight, although the reserves of high grade coking coals are none too plentiful and may present some problem in the not-too-distant future. Our disposition to take coal for granted because of the magnitude of the reserves is illustrated by the fact that little reliable information is available on our coking coal reserves despite the fundamental importance of the commodity. The same apathy confronts the conservationist who views with alarm the 30 to 40 per cent average loss of coal sustained in mining. Some of this loss is unavoidable, but much could be prevented if economic conditions in the industry permitted. Conservation can also be promoted through further progress in the technology of coal use, and some have questioned the wisdom from a national viewpoint of consuming limited reserves of high grade coking coals in non-coke uses. If we are to turn to our coal resources for liquid fuels in the future, the rate of exhaustion probably will more than treble, and the need for conservation will be correspondingly greater.

"Copper, lead and zinc occupy a significant position among the minerals of secondary importance to the basic national economy. The United States has had virtual self-sufficiency in these metals for many years. However, our resources were unequal to the demands of this war and large imports have been required in recent years. Despite the fact that the demand has been very much larger in this war, the output of copper and zinc has been only moderately higher, and that of lead substantially lower than in World War I. This record can be ascribed

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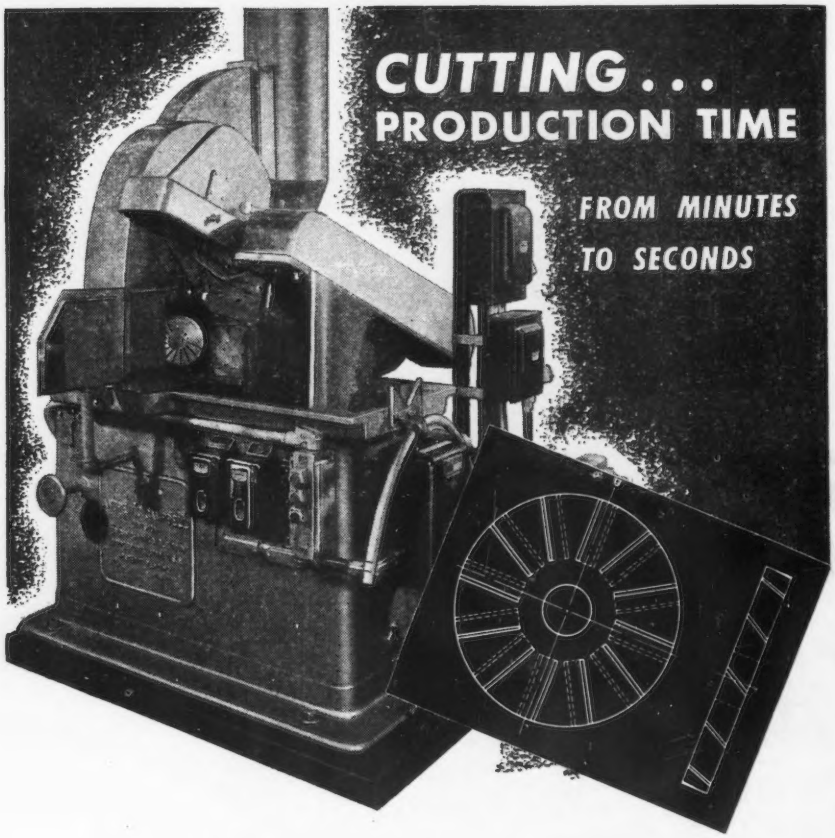
This new Model 3-B JIGMIL has automatic power means to position the spindle from one location to another accurately to within much less than .0001 (one-ten-thousandths part of an inch). Thus, extreme laboratory accuracy is conveniently available with ordinary skill that would normally make such precision very high in cost. This, and many other refinements, go further to prove that the JIGMIL Idea is a totally new approach to the problems of precision boring at a new low cost.

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**



PROBLEM: To cut angular slots in a disc 8″ in diameter, approximately 1¼″ thick, going in from the periphery (see sketch). The material was heat-resisting stainless steel. The way the manufacturer was doing this job required a larger battery of machines to meet production requirements and it would take minutes to make each cut.

SOLUTION: A **CAMPBELL MODEL NO. 401 CUTAMATIC WET ABRASIVE CUTTING MACHINE** was rearranged to receive an automatic indexing fixture which compensates for wheel wear and depth of cut. The time required for cutting each slot (approx. 2 sq. in.) is 15 seconds. One operator can run all machines required for full production schedule.

★ ★ ★

Unusual? Yes. We are constantly adapting **CAMPBELL ABRASIVE CUTTING MACHINES** to do unusual jobs—or to do ordinary jobs faster, better or at lower cost. Perhaps we could solve a cutting problem for you. We'll be glad to talk it over.

Campbell

ABRASIVE CUTTING MACHINES

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TRADE MARK

in part to various causes such as manpower and equipment shortages, the fact that the industries had not fully recovered from a protracted depression, and insufficient price; but there is wide agreement that the ore reserve situation was the principal contributing cause. That depletion is well advanced in these industries, is an inescapable conclusion from the record and the present knowledge of remaining reserves.

"Copper reserves as of 1944 have been estimated by Ralph S. Cannon of the Geological Survey and McHenry Mosier of the Bureau of Mines at 20 million short tons of recoverable metal under conditions prevailing at that time. Since they include some reserves available only at premium prices they may be considered as a generous appraisal of commercial reserves under normal conditions. Twenty-five per cent of the tonnage is classed as inferred. It is estimated that production could be maintained at the rate of 1 million tons per year for nearly 10 years following which there would be a gradual decline to exhaustion. Submarginal resources have been estimated at 10 million tons of copper contained in 1.25 billion tons of material.

"Estimated reserves of 6c. lead under prewar operating conditions were only 5 million short tons in 1944, of which only a third was classed as measured and indicated. Under emergency conditions the total reserve including 6c. lead, was estimated at only 6.6 million tons. Peak war production in 1942 was 27 per cent below the all time peak established in 1925.

"The quantity of zinc available at 6c. in the reserves estimated as of 1944 was 11.2 million tons of recoverable metal, more than half of which was in inferred ore. Under emergency prices the total reserve was believed to contain nearly 17 million tons. Estimates for lead and zinc by E. T. McKnight of the Geological Survey and E. F. Fitzhugh, Jr., of the Bureau of Mines.

"Production of lead and zinc may be expected to decline within a few years. Zinc has been particularly affected by depletion in the Tri-State District, which produced over 400,000 tons or 55 per cent of the total output of the country in 1926, but contributed only 200,000 tons or 27 per cent of the total in 1943. A substantial part of the district's output during the war has required premium prices, and an abrupt drop is anticipated with a return to peacetime conditions after the war.

RACOLLOY 18-8

For fine performance on these classes of steel: Unstabilized 18-8, Types 301, 302, 304, 306, 308. These electrodes are used for parts intended to resist relatively mild corrosive conditions in service, or for parts that can be heat treated after welding. For example, dairy, distillery and restaurant equipment, and chemical tanks.

WELDING CODES—Racolloy 18-8 electrodes meet requirements of U. S. Navy Bureau of Ships Specification 46E4 (INT) Grade I.

RACOLLOY 18-8Cb

These electrodes containing columbium are used with exceptional success for all-position welding of Types 321 and 347. Applications include welding stainless steel pressure vessels for continuous service in the temperature range of 700° —1600° F. These uses include chemical plant, oil refinery equipment and aircraft exhaust collector systems.

WELDING CODES—Racolloy 18-8Cb electrodes meet the requirements of U. S. Navy Specification 46E4 (INT) Grade II.

The REID-AVERY COMPANY
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A practical way to compensate in part for the shortage of tool makers and machine operators is to increase the hourly output of each machine tool. This can be done easily, safely and without loss of efficiency on lathes, planers, slotters, shapers, turret lathes and hand screw machines, by taking advantage of the extra capacity offered by the ARMSTRONG TOOL HOLDER System.
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Shot Peening

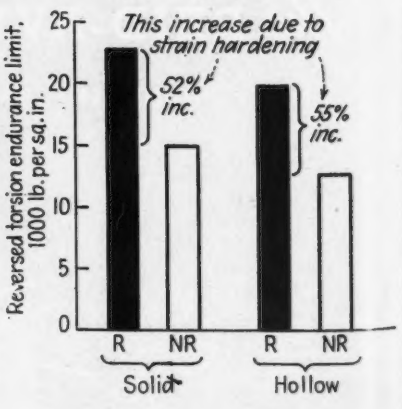
(CONTINUED FROM PAGE 76)

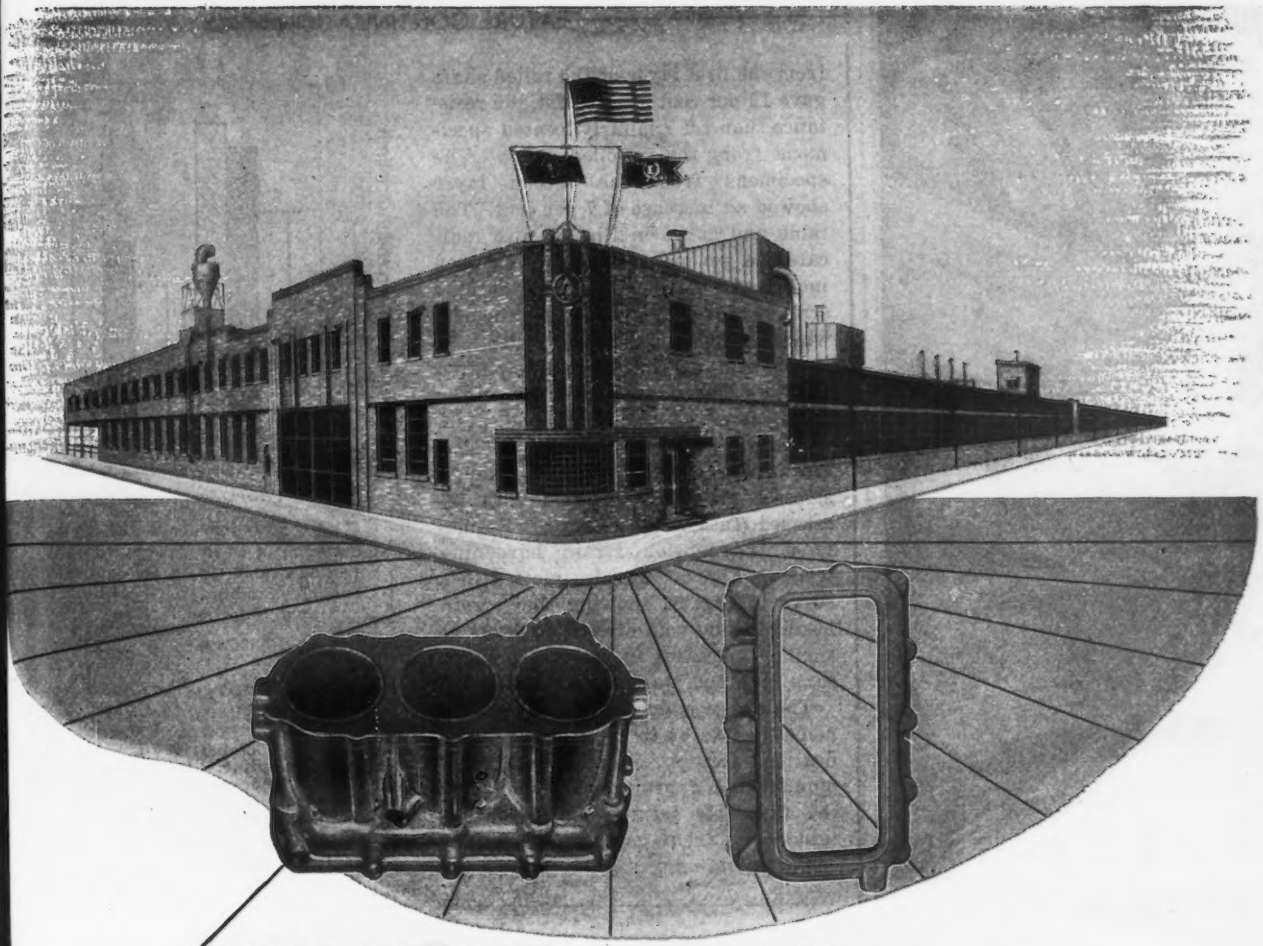
the effects of strain hardening remained. Fatigue results from such solid and hollow bars, which were investigated in both the rolled and not rolled condition, are shown in Fig. 48 for bending and in Fig. 49 for torsion. The basis for his conclusions above is apparent from fatigue results.

Moore and Kommers[48] also developed data on 0.18 per cent C steel and the author[14] on 0.48 per cent C steel, as shown in Fig. 50, which indicated that the presence of strain hardening without residual stresses produced large increases in fatigue resistance. In these tests on two plain carbon steels by independent investigators, steel bars were cold stretched in tension to obtain two degrees of elongation. Then R. R. Moore plain fatigue specimens were machined from these bars. It is apparent that only strain hardening remained in the specimens and residual stresses were negligible so that the latter had no influence on the improved fatigue values shown in Fig. 50.

Again further tests were made which indicated that strain hardening alone without residual stresses gave increased fatigue resistance. Fatigue specimens 0.080 in. diameter were machined from the surface layers of 2 in. diameter shafts, some of which shafts were surface rolled and others not rolled. In this manner practically all residual stresses were removed from the small specimens by machining them from the rolled shafts and only the effect of strain hardening remained. The results[15] from bending fatigue tests on these specimens are given in the table portion of Fig. 51. Here it is shown that the specimens

FIG. 49—Torsional fatigue resistance influenced by surface rolling; hollow specimen was bored out after rolling. R = rolled and NR = not rolled.





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from the first layer of the rolled shaft gave 12 per cent greater fatigue resistance than for similarly located specimens from the unrolled shaft. The specimens from the second layer showed an increase of 7 per cent. The table and curve in Fig. 51 also indicate the general relationship between increased hardness and fatigue strength of 1 in. and 2 in. shafts which have been surface rolled. It should be noted that the points plotted for the 0.080 in. specimens fall on the same curve as the 1 in. and 2 in. specimens thereby indicating that strain hardening and not residual stresses may be associated with increased fatigue resistance. Results from the tension strain hardening tests in Fig. 50 are also plotted in a curve in Fig. 51 showing that strain hardening by cold stretching leads to smaller increases in fatigue strength than obtained by surface rolling.

The above examples, and others not mentioned serve to confirm the justification for a more conservative opinion and appraisal of reasons for the favorable fatigue resistance obtained by various methods of surface compression.

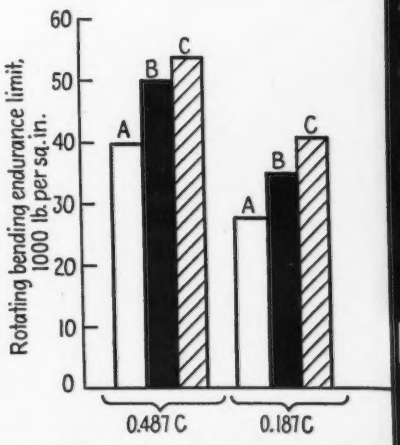


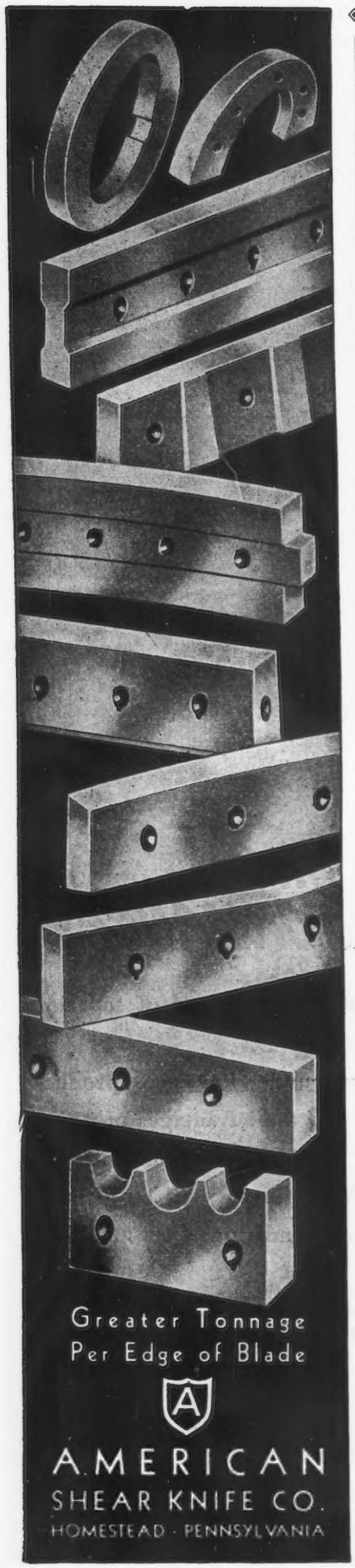
FIG. 50 — Influences of cold stretching on fatigue resistance: (A) no stretch; (B) 8 per cent reduction in area; (C) 17/18 per cent reduction in area.

Bibliography Continued

[38] J. H. Frye, Shot Peening Applied to Ordnance Parts, A.S.M. Symposium on Shot Peening, October, 1944.

[39] K. B. Valentine, "Improving the Impact Stress Endurance of a Carburized Gun Part," Metal Progress, vol. 46, No. 4, September, 1944, pp. 467-72.

[40] W. Staedel, "Fatigue Strength of Screws," Mitt. d. Materialprüfungsanstalt, vol. 4, Berlin, 1933.



[41] A. Thum and W. Bantz, "Causes of Improved Fatigue Resistance of Specimens with Compressed Surface," Forschung, vol. 6, May-June, 1935, pp. 121-28.

[42] H. Buhler and H. Buchholtz, "The Effect of Residual Stresses on The Dynamic Strength," Mitt. a.d. Forschungs-Inst., Dortmund, vol. 3, 1933, pp. 235-248.

[43] O. Foppl, "The Causes to Which the Increase of the Fatigue Endurance by Surface Pressing is Due," Mitt. d. Wöhler Inst. Braunschweig, No. 25, 1935, pp. 52-61.

[44] H. Funk and H. Steps, "Molecular Roughness and Surface Structure," Kolloid Zeitschrift, vol. 70, 1935, pp. 109-19.

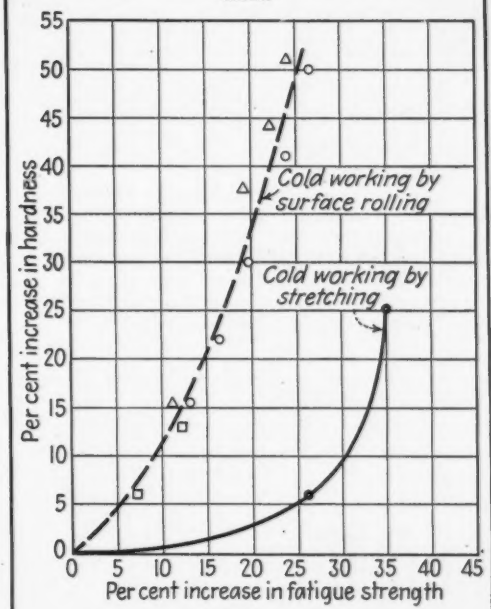
[45] George Beilby, Aggregation and Flow of Solids, 1921, MacMillan & Co.

[46] W. Boas and E. Schmid, "The Structure of Differently Prepared Metal Surfaces," Naturwiss, vol. 20, 1932, p. 416.

[47] R. W. Bailey, "Plastic Yielding and Failure of Ductile Metals, A Criterion and Its Application," Proc. Instn. Mech. Engrs., London, vol. 128, 1939, pp. 101-107.

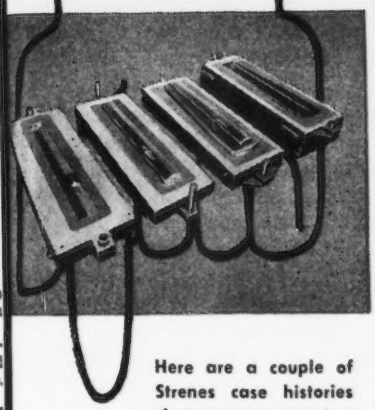
[48] H. F. Moore and V. B. Kommers," An Investigation of the Fatigue of Metals," Eng. Exp. Station, University of Illinois, Bulletin No. 124, Urbana, Ill., 1921.

FIG. 51—Relation between increased hardness and increased fatigue strength of rolled specimens.



ROLLER PRESSURE, LB.	FATIGUE STRENGTH LB./SQ. IN.	FATIGUE STRENGTH PER CENT	SURFACE HARDNESS VICKERS NO	SURFACE HARDNESS PER CENT
△—△ 1" DIA. SPECIMENS				
0	36000	100	149	100
212	40000	111	172	115
1125	43000	119	205	137
1600	44000	122	215	144
2170	44600	124	225	151
○—○ 2" DIA. SPECIMENS				
0	34400	100	153	100
600	38800	113	177	115
1200	40000	116	187	122
2460	41200	119	199	130
4500	42600	124	216	141
6380	43500	127	230	150
□—□ 0.080" SPEC. FROM 2" SPEC.				
1ST. UNROLLED	38500	100	153	100
1ST. ROLLED	43000	112	173	113
2ND. ROLLED	41200	107	162	106
●—● 0.3" SPEC. FROM COLD STRETCHED BARS				
NO RED. AREA	39800	100	183 BHN	100
8% " "	50,000	126	194 "	126
17% " "	54,000	135	228 "	135

STRENES METAL POINTS THE WAY



Here are a couple of Strenes case histories that may suggest a way to reconvert to civilian production a little faster.

Tractor Top-Dies

Strenes Metal—cast-to-shape—was specified for stamping tractor hood tops. An accurate cost check showed a saving of around 50% in machining time due to the cast-to-shape construction. On reconversion tooling rush, such a saving will be highly advantageous.

Hydrator Pan Die

Dies of Strenes Metal stand up, too. One refrigerator hydrator pan die, for instance, stamped 2,000,000 parts with a 3½" draw out of .50 material. And, due to the self-lubricating property of the metal, stoning and polishing operations were virtually unnecessary.

Both for civilian and war products, Strenes Metal has been a definite help on many tooling programs. Facts and figures on request. Write today.

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Light in weight yet built for heavy-duty service, it enables any mechanic to make quick, accurate tests on injector opening pressure, spray pattern, etc., and detect stuck needle valves and leakage around valve seats. Tests both large and small injectors, on bench or engine, at pressures up to 10,000 p.s.i. Prevents costly delays and possible damage to engine.

Ideal for testing hydraulic devices.

Write for bulletin on this practical, low-cost unit.

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MACHINE TOOLS

. . . News and Market Activities

VE-Day To Bring Machine Tool Confusion

Cleveland

• • • More than anything else, the speed of the Allied onslaught in Germany has brought into sharp focus the fact that machine tool builders in particular, and industry in general, will find VE-Day's immediate aftermath a period of considerable confusion. A mild industrial pandemonium is to be expected, of course, but even pessimistic pundits concede that much could have been done, and a few things can still be done to reduce it to a more feasible minimum without hampering the war effort in the least.

Critics are quick to point out, at any mention of postwar, that the machine tool industry is still without a termination policy that will work, and the one now in use is functioning very badly. It has also been reported that officers in the field still do not know how to settle a contract. In essence, the industry is proceeding in great detail at a time when things will have to be adjusted quickly in order to maintain employment. But under the priorities imposed, the machine tool surplus is still unavailable.

Contractors, of course, have options, but the process requires weeks when the contractor tries to do it, and even with the prices established by the Clayton formula, trying to buy the machines is a long drawn-out affair. Consequently, when the Germans do collapse, businessmen will not miss a bargain, but will buy new equipment and the government will be stuck with thousands of machine tools for the next 50 years, it is said.

Various executives here, however, like to believe that it is not yet too late to do something about the problem and have suggested several steps that, if taken, might prove fortunate factors in stemming the tide.

1—Every contractor should be asked to exercise his option and this can be accomplished by the simple interchange of two letters, changing the title on the machine. Naturally, the machine would still be used for war, but it would no longer be a part of the surplus.

2—The armed forces should be persuaded to come to some conclusions on what machines they want to retain.

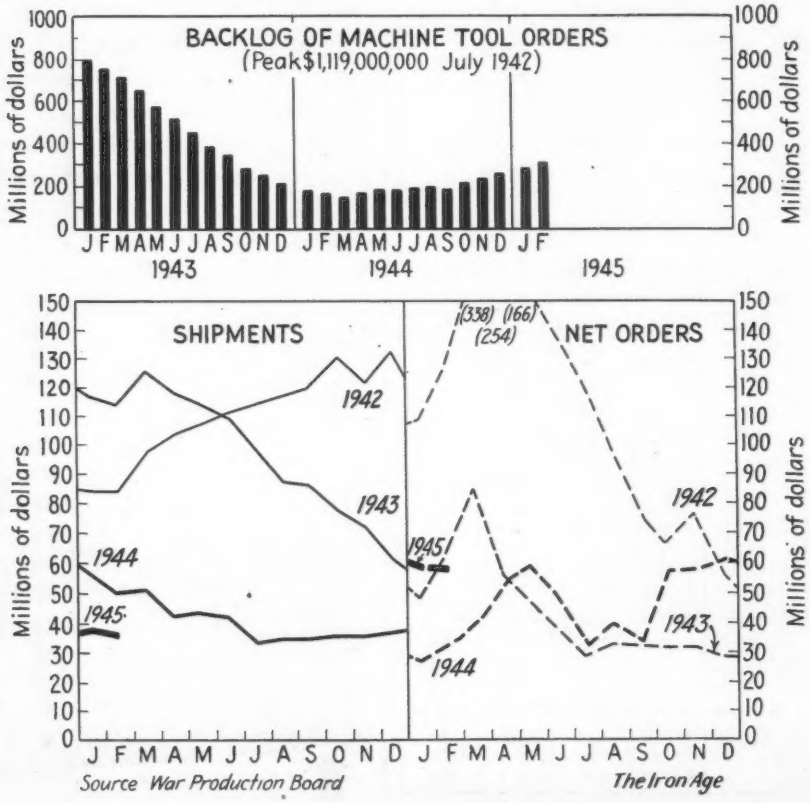
3—Every metalworking plant should be told what machines are available, how they can be bought, and what the terms of payment will be.

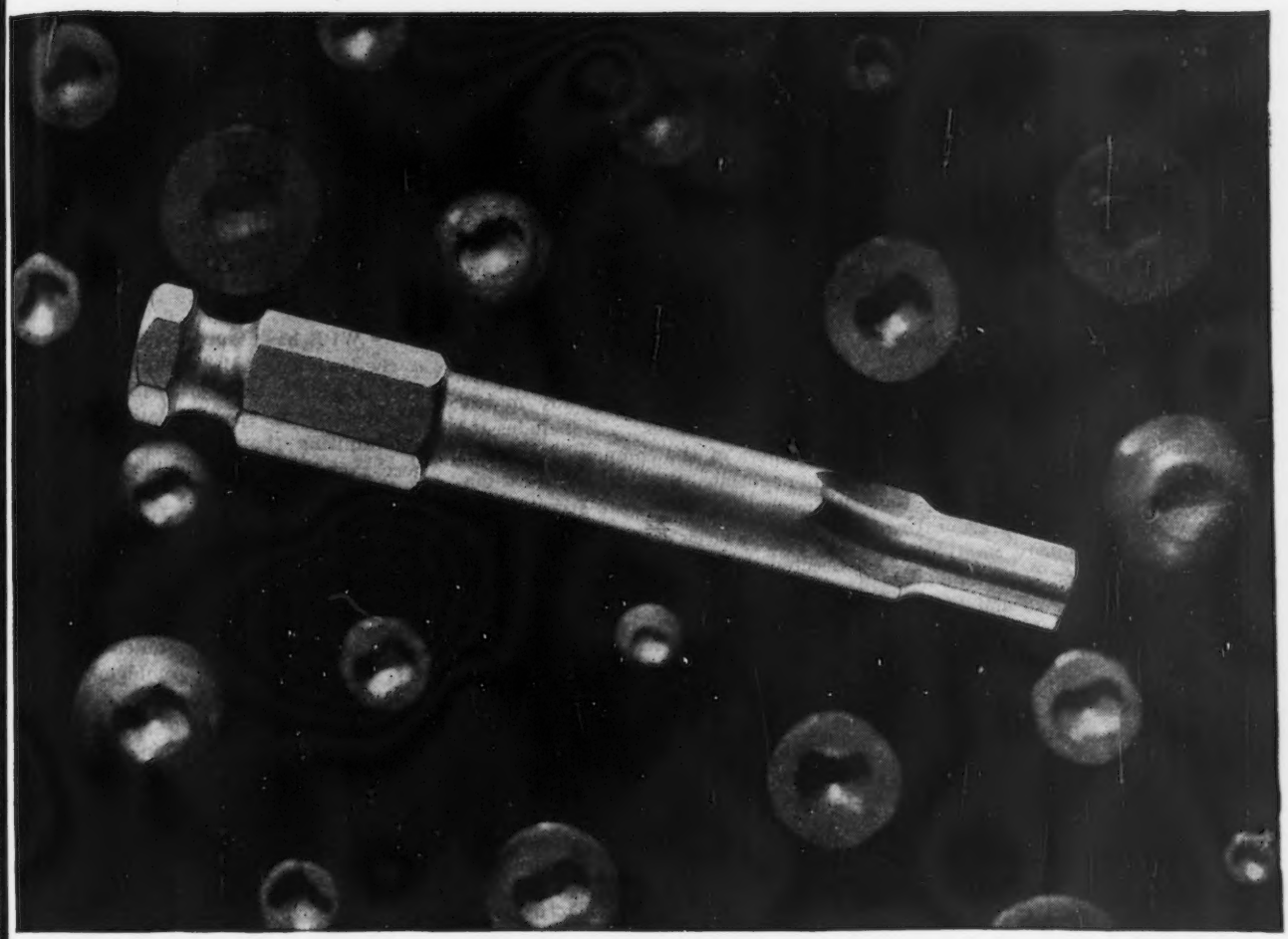
4—The Surplus Property Board should get right now from preferred prospects such as government departments, state and county institutions, and other non-profit organizations, a list of the machine tools they need. In other words, every possible channel should be opened.

It has been pointed out in these columns before, that there seems to be too much official concern over the fact that someone is going to make a profit on the surplus. But if the problem of surplus machine tool disposal is to be handled properly, it should be done through regular trade channels, who certainly will not perform this task for charity. And, anxious as some of the machine tool companies are to have the disposal of their own equipment, they are not going to do it for nothing and if the Clayton formula holds all the way through, machines will probably have to be given to them on consignment, if this plan is adopted.

• Machine tool shipments in February reported by 198 companies amounted to $36,018,000, a decrease of 3.6 per cent under January valuation, WPB Tools Division said on March 26. Net new orders for machine tools were $58,024,000. This is one per cent under the January valuation of $58,619,000.

Based on the daily rate of shipments, however, February shipments showed an increase of 6.8 per cent, officials said. Rated unfilled orders are now valued at $220,445,000. Total unfilled orders, including unrated, amounted to $303,445,000 or 7.9 per cent over January figures of $281,252,000, WPB said. Producers reported an employment increase of one per cent during February to 57,300 persons from 56,600 employed in January. Compared with February, 1944, the number of wage earners in the industry has decreased by 15,200, or 21 per cent.





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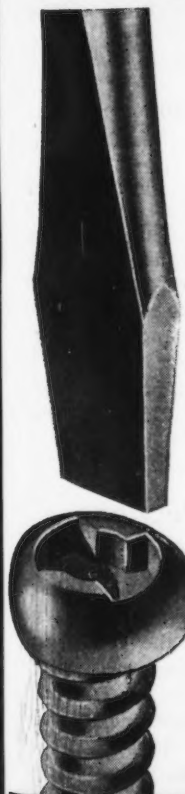
Note, too, that the driving score of this bit is multiplied time and time again because it may be repeatedly restored to original efficiency by a 60-second application of the end surface to a grinding wheel.

Other special features incorporated in CLUTCH HEAD *Screws contribute importantly to greater safety, higher production, and lower costs. We invite your personal investigation of these and will send you,* BY MAIL, *package assortment of* CLUTCH HEAD *Screws, sample Type "A" Bit, and illustrated Brochure.*



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NON-FERROUS METALS

. . . News and Market Activities

WLB Grants Increases To Aluminum Workers

Washington

• • • **The National War Labor Board** has unanimously directed the Aluminum Co. of America to pay shift differentials of 4 and 6c. an hour for second and third shift work, respectively, in 20 plants where the United Steelworkers of America, CIO, is the collective bargaining representative. The company previously paid differentials of 3 and 5c. The union had asked differentials of 10 and 15c. The board has directed that the differential increase be made retroactive to May 1, 1944, the expiration date of the previous contract. Industry members dissented on the issue of retroactivity.

The union's request that the approximately 50,000 employees involved be granted a 15c. an hour general wage increase as a cost-of-living adjustment was denied as contrary to existing wage stabilization policy. The board also denied the union's request for a minimum hiring rate of 95c. an hour. Present hiring rates vary, but most persons are hired at rates between 74 and 85c. Labor members dissented to both denials.

The board unanimously directed that wage rates for new jobs may be the subject of final and binding arbitration if the employee files a grievance alleging the new rates does not bear a fair relationship to other jobs in the same plant. The same procedure applies to disputes arising from a change in rate due to a change in job content. The union request for a guarantee of no less than 40 hr. pay for every week in the year was denied as outside the authority of the board, with labor members dissenting. The board, however, recommended that the study of guaranteed annual wages to be undertaken by the President's Committee include the problem of regularizing production, guaranteeing full employment, and stabilizing earnings in the aluminum industry.

The company was directed by the board, with industry dissenting to checkoff union dues, up to $1.50 per month, and initiation fees of $3.00. The board denied the union request for a joint National Wage Scale Committee which would be empowered to bring about uniform wage structures in the aluminum industry. Labor members dissented. The board, however, unanimously found that the contract between the parties which states that "the company is willing, at all times, to discuss and negotiate any matter pertaining to wages . . ." includes the willingness of the company to discuss and negotiate regarding the establishment of a wage rate structure.

With industry dissenting, the board directed that the contract between the parties should include a provision for time and one-half pay for Sundays and six holidays, with Monday to be observed when the holiday falls on Sunday. The board also directed time and one-half for the sixth consecutive day of work in the regularly scheduled work week and double time for the seventh consecutive day.

WPB Sees March Gain In Brass Production

Washington

• • • **Robert P. Patterson,** undersecretary of War, has disclosed that more than 8 million shells are being fired monthly in the European theater of operations alone, as compared with a total of less than 10 million shells fired by the AEF in the last war.

To bring shell production into line with consumption, it is necessary for brass mills to attain the recently established monthly production goals of 384 million lb. for brass mill strip and 130 million lb. for rods WPB-Copper Division officials have told the Brass Mill Industry Advisory Committee. March production reports to date indicated that brass mill production will show a big gain over each of the first two months of the year, they said.

Total brass mill production amounted to 463,958,000 lb. in February as compared with somewhat less than 478 million in January. Of this amount, strip production accounted for 300,543,000 lb. as against 305,914,000 in January; rod, 98,608,000 as compared with 101,000,000; tubing, 30,213,000 as against 33,500,000, and copper products, 34,594,000 as against 37 million lb. in January.

WPB Modifies Control By Amended Lead Order

New York

• • • **WPB has issued an amendment** to the lead order, M-38, effective April 1 restricting the use of lead and lead products to 64 specified applications, and limiting their use to the extent necessary to meet applicable specifications or proper service performance of the end product, or where substitutes are impracticable or prohibited by WPB order. The sale and delivery of new articles of the following classifications containing lead are specifically prohibited by the amended order: Buttons, badges, emblems and regalia (except for sale to the Army and Navy, War Shipping Administration, Maritime Commission and Veterans Administration); costume jewelry, novelties and trophies; games or toys; tennis court markers; and statuary and art goods (except church goods).

By the issuance of this amendment to the lead order, WPB has discontinued control by prohibiting a long list of specific applications

Lead Market Quieter

New York

• • • **Producers report** that the position of lead is somewhat quieter although orders continue in good volume. They consider this to be a reaction to prospective cutbacks in naval building, cartridge requirements and many other war programs soon after V-E Day. However, it is pointed out that civilian consumption of lead could readily replace any drop in lead consumption for war production.

High Ingot Production

New York

• • • **Combined shipments of ingot** brass and bronze during February dropped slightly from the preceding month to 39,297 short tons, according to an announcement by the Defense Council of the Ingot Brass and Bronze Industry. The fewer days in February account for this minor drop amounting to 1724 tons, and therefore it can be conceded that the production of brass and bronze ingots continues at peak.

Primary Metals

(Cents per lb., unless otherwise noted)

Aluminum, 99+%, del'd (Min. 10,000 lb.)	15.00
Antimony, American, Laredo, Tex.	14.50
Beryllium copper, 3.75-4.25% Be; dollars per lb. contained Be	$17.00
Cadmium, del'd	90.00
Cobalt, 97-99% (per lb.)	$1.50 to $1.57
Copper, electro, Conn. valley	12.00
Copper, electro, New York	11.75
Copper, lake	12.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.9%, dollars per troy oz.	$4.00
Iridium, dollars per troy oz.	$120.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9 + %, carlots	20.50
Magnesium, 12-in. sticks, carlots	27.50
Mercury, dollars per 76-lb. flask, f.o.b. New York	$160.00 to $165.00
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per oz.	$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.65

Remelted Metals

(Cents per lb. unless otherwise noted)

Aluminum, No. 12 Fdy. (No. 2)	9.00 to 10.00
Aluminum, deoxidizing No. 2, 3, 4	$6.00 to 9.50
Brass Ingot 85-5-5-5 (No. 115)	13.25
88-10-2 (No. 215)	16.75
80-10-10 (No. 305)	16.00
No. 1 Yellow (No. 405)	10.25

Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.37	....	20.37
Copper, H.R.	....	17.37	....
Copper drawn	....	18.37	....
Low brass, 80%	....	20.40	20.15
High brass	....	....	19.48
Red brass, 85%	....	20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut	....	15.01	....
Commercial bronze, 90%	....	21.32	21.07
Commercial bronze, 95%	....	21.53	21.28
Manganese bronze	24.00	....	28.00
Phos. bronze, A, B, 5%	....	36.50	36.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympic or equal	....	25.50	26.00
Nickel silver, 5%	....	28.75	26.50
Architect bronze	19.12	....	....

Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier; 2S and 3S, 21.2c.; 52s, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness; 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper; 2000-lb. base, 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals: ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 24c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

NONFERROUS SCRAP METAL QUOTATIONS

†*(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums—other prices are current quotations)*

Copper, Copper Base Alloys

OPA Group 1†

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
No. 2 copper borings	8.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2†

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Contaminated gilded metal solids	8.50
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25
Automobile radiators	7.00
Zincy bronze borings	8.00
Zincy bronze solids	8.00

OPA Group 3†

Fired rifle shells	8.25
Brass pipe	7.50
Old rolled brass	7.00
Admiralty condenser tubes	7.50
Muntz metal condenser tubes	7.00
Plated brass sheet, pipe reflectors	6.50
Manganese bronze solids	7.35[1]
Manganese bronze solids	6.25[2]
Manganese bronze borings	6.50[1]
Manganese bronze borings	5.50[2]

OPA Group 4†

Refinery brass	4.75*

*Price varies with analysis. [1] Lead content 0.00 to 0.40 per cent. [2] Lead content 0.41 to 1.00 per cent.

Other Copper Alloys

Briquetted Cartridge Brass Turnings	8.625
Cartridge Brass Turnings, Loose	7.875
Loose Yellow Brass Trimmings	7.875

Aluminum

Plant scrap, segregated

2S solids	8.00
Dural alloys, solids 14, 17, 18, 24S 25S	5.00
turnings, dry basis	3.00
Low copper alloys 51, 52, 61, 63S solids	7.50
turnings, dry basis	5.75

Plant scrap, mixed

Solids	4.00
Turnings, dry basis	2.50

Obsolete scrap

Pure cable	8.00
Old sheet and utensils	6.00
Old castings and forgings	5.00
Pistons, free of struts	5.00
Pistons, with struts	3.00
Old alloy sheet	5.00

Magnesium*

Segregated plant scrap

Pure solids and all other solids, exempt	
Borings and turnings	1.50

Mixed, contaminated plant scrap

Grade 1 solids	3.00
Grade 1 borings and turnings	2.00
Grade 2 solids	2.00
Grade 2 borings and turnings	1.00

*Nominal.

Zinc

New zinc clippings, trimmings	6.50
Engravers, lithographers plates	6.50
Old zinc scrap	4.75
Unsweated zinc dross	5.00
Die cast slab	4.50
New die cast scrap	4.45
Radiator grilles, old and new	3.50
Old die cast scrap	3.00

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead including cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%, Cu under ½%, 26c. per lb.; 90 to 98% Ni, 26c. per lb contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point in 500 lb lots)

Copper, frt. allowed	
Cast, oval, 15 in. or longer	25⅛
Electrolytic	22⅞
Rolled, oval, straight	19⅜
Curved	20⅜
Brass, 80-20, frt. allowed	
Cast, oval, 15 in. or longer	23⅝
Zinc, cast, 99.99, 15 in. or longer	16¼
Nickel, 99 per cent plus, frt. allowed	
Cast	47
Rolled, depolarized	48
Silver, 999 fine	
Rolled, 1-9 troy oz., per oz.	58*

Chemicals

(Cents per lb., f.o.b. shipping point)

Copper cyanide, 1-5 bbls.	34.00
Copper sulphate, 99.5, crystals, bbls.	7.75
Nickel salts, single, 425 lb. bbls., frt. allowed	13.50
Silver cyanide, 100 oz. lots	40.82*
Sodium cyanide, 96 per cent, domestic, 100 lb. drums	15.00
Zinc cyanide, 100 lb. drums	33.00
Zinc sulphate, 89 per cent, crystals, bbls., frt. allowed	6.35

*Price based on use of foreign silver.

SCRAP

Industry Marks Time; Scrap Stocks Down

New York

• • • **Conditions in the scrap industry remain** pretty much the same as in recent weeks with very few changes in price and a gradual improvement in the flow of scrap resulting from improved weather and transportation facilities.

According to the Bureau of Mines scrap stocks at plants of mills, producers and dealers have continued to decline in January, while consumption during the month has increased. Stocks of scrap at the end of the month totaled 5,023,000 gross tons, consisting of 1,290,000 tons of home scrap and 3,733,000 tons of purchased scrap. Home stocks dropped 7000 tons during the month and purchased scrap, 305,000 tons. The Bureau observes that "although suppliers increased shipments of scrap to consumers the resulting gain was not large enough, thereby forcing consumers to rely on their stockpiles of purchased scrap to provide enough material for the continued high consumption. Also, despite increases in the production and salvage of scrap, suppliers were compelled to deplete their inventories so that shipments to consumers could be increased."

Chicago and West Coast report major movements of scrap out of the normal market area. In both districts this has had a material effect on the price structure, serving to strengthen them to the extent of $2 a ton in blast furnace grades at Chicago and $1 a ton in San Francisco for selected open hearth grades.

There is evident about the entire scrap industry a feeling of cautious waiting, with mills, producers and dealers anxiously weighing the effect of European affairs on contract cutbacks and scrap prices, respectively. Apparently the recent action by manpower authorities has not become a factor in this picture since practically all districts refer to continued shortages of scrap labor.

o o o

PITTSBURGH — Manpower continues to be the hampering factor in dealer scrap movement in this area. While there is always a large amount of production scrap that continually moves, the dealer scrap movement has been hampered for the past four months by a combination of weather, car shortages and manpower, which is still as scarce as ever. Cast scrap is still at a high premium, with consumers willing to stand practically any freight absorption to get it into the district.

•

CHICAGO—A 1000-ton order by a local mill for short shoveling turnings, cast iron borings, and mixed borings and turnings at $11.50 was made last week, reflecting a $2 rise since the last local transaction some time ago. The rise is attributable directly to large tonnages of material which have been shipped to other districts at prices comparable to the new figure, one out-of-town mill having offered $11.06 on track here. Other grades continued steady, although there was some interest in alloy grades at higher levels.

•

DETROIT — Opening of automotive lists last week found bids for turnings grades considerably above going market levels. However, after these deals were made brokers failed to increase offering prices beyond minor readjustments and the list remained about constant. Alloy extras are again being paid by some outside mills for some specifications.

BOSTON—Market is functioning a little more freely. Some foundries report they have acquired a 60 day supply of cast. Others, less fortunate, are much better off than they were. Boiler tubes are moving very well, as is low phos plate at ceiling prices. Eastern Pennsylvania mills take all the heavy steel and turnings they can get. Shipments there are not heavy but more so than a month ago.

•

CINCINNATI—The market shows relatively no change from last week, with good cast scrap and rails in high demand but the supply not too plentiful. Other items seem to be in a reasonably good supply, although prices on all these items except turnings continue to be at ceiling prices.

•

ST. LOUIS—Receipts of scrap iron in the St. Louis industrial district were slightly heavier than the preceding week, with an improvement of weather in some localities. But offerings still are light, due principally to the shortage of manpower to gather and process the material. The labor shortage has also caused a curtailment of railroad offerings. Prices are unchanged.

•

BUFFALO—Shipments of heavy scrap to mills were on the rise during the last week although receipts continued short of requirements, resulting in further depletion of low stockpiles. Most of this material came by rail from the district's normal scrapshed with consignments from the Michigan industrial area augmenting the total. In addition 90,000 to 100,000 tons has been bought and awaits shipment from the Upper Lakes Region. Two of the Bethlehem Line's self-unloaders, the Venus and LaGonda that wintered in Buffalo, are scheduled to leave for Detroit this week to bring back the first lake scrap cargoes of the 1945 navigation season.

•

NEW YORK—Dealers report that they are continuing to attempt to get out mill's requirements of scrap and that conditions in the local market remain about the same as reported in recent weeks. All grades including turnings continue to sell at ceiling levels. One of the Eastern Pennsylvania mills has stopped accepting shipments of turnings and this will naturally increase the market supply and may act as wedge to break the price of turnings here.

•

CLEVELAND—It is felt here that the boat movement, as is usually the case, will have a sympathetic effect on the turnings market. Some quarters anticipate sales at lower levels during April, with market conditions difficult to interpret right now. No one seems at all certain of just what turn it may take.

•

PHILADELPHIA—Because of the free supply of turnings, several mills here have held up shipments. Open hearth grades are still far from plentiful, although shipments are improving, but mills are hesitant to place orders for sizable tonnages. In spite of very low inventories, mills are evidently determined to keep them so and will order only for current needs. There have been no price changes but it is likely that when turnings are again acceptable, it will be at below ceiling prices.

•

BIRMINGHAM—Although demand remains strong and prices continue firm generally for scrap in this market, labor shortages that hinder preparation are keeping movement of material at a relatively low point. Preparation difficulties are being felt particularly by consumers of foundry and electric furnace grades even though demand for those grades is at the bottom of the list. Supplies of cast grades are very limited here regardless of the labor situation.

•

SAN FRANCISCO—Steadily continued rail shipments of plate scrap to the Middle West from Maritime shipyards of the San Francisco Bay, Portland and Puget Sound areas have temporarily thinned supplies for local mills and buyers to such an extent that recent purchases at Seattle on allocation and from dealers have been at ceiling, although the advance of $1.00 per ton for No. 1 heavy melting grade has not appreciably increased available supply. Production of shipyard scrap decreases as original construction contracts terminate. Southern California remains the predominantly surplus area in the far West.

Going prices as obtained in the trade by IRON AGE editors, based on representative tonnages (for ceiling prices see O. P. A. schedule No. 4). Where ceiling prices are quoted they do not include brokerage fee or adjusted transportation charges. Asterisks indicate grades selling at ceilings.

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. melting	$20.00*
RR. hvy. melting	21.00*
No. 2 hvy. melting	20.00*
RR. scrap rails	21.50*
Rails 3 ft. and under	23.50*
No. 1 comp'd sheets	20.00*
Hand bdld. new shts.	20.00*
Hvy. axle turn.	19.50*
Hvy. steel forge turn.	19.50*
Mach. shop turn.	$13.00 to 13.50
Short shov. turn.	15.50 to 16.00
Mixed bor. and turn.	13.00 to 13.50
Cast iron borings	14.50 to 15.00
Hvy. break. cast.	16.50*
No. 1 cupola	20.00*
RR. knuck. and coup.	24.50*
RR. coil springs	24.50*
Rail leaf springs	24.50*
Rolled steel wheels	24.50*
Low phos. bil. crops	25.00*
Low phos.	22.50*
RR. malleable	22.00*

CHICAGO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.75*
No. 2 hvy. melting	18.75*
No. 1 bundles	18.75*
No. 2 dealers' bndls.	18.75*
Bundled mach. shop turn.	16.25 to 16.75
Galv. bundles	14.25 to 14.75
Mach. shop turn.	8.50 to 9.00
Short shovel. turn.	11.00 to 11.50
Cast iron borings	11.00 to 11.50
Mix. borings & turn.	11.00 to 11.50
Low phos. hvy. forge	23.75*
Low phos. plates	21.25*
No. 1 RR. hvy. melt.	19.75*
Reroll rails	22.25*
Miscellaneous rails	20.25*
Rails 3 ft. and under	22.25*
Locomotive tires, cut	24.25*
Cut bolsters & side frames	22.25*
Angles & splice bars	22.25*
Standard stl. car axles	25.75*
No. 3 steel wheels	22.75 to 23.25
Couplers & knuckles	23.25*
Agricul. malleable	22.00*
RR. malleable	22.00*
No. 1 mach. cast	20.00*
No. 1 agricul. cast	20.00*
Hvy. breakable cast	16.50*
RR. grate bars	15.25*
Cast iron brake shoes	15.25*
Stove plate	19.00*
Clean auto cast	20.00*
Cast iron carwheels	20.00*

CINCINNATI

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50*
No. 2 hvy. melting	19.50*
No. 1 bundles	19.50*
No. 2 bundles	19.50*
Mach. shop turn.	$8.00 to 8.50
Shoveling turn.	9.00 to 9.50
Cast iron borings	8.50 to 9.00
Mixed bor. & turn.	8.00 to 8.50
Low phos. plate	22.00*
No. 1 cupola cast	20.00*
Hvy. breakable cast	16.50*
Stove plate	19.00*
Scrap rails	21.50*

BOSTON

Dealers' buying prices per gross ton, f.o.b. cars

No. 1 hvy. melting	$15.05*
No. 2 hvy. melting	15.05*
No. 1 and 2 bundles	15.05*
Busheling	15.05*
Turnings, shovelings	$11.00 to 11.06
Machine shop turn.	9.00 to 9.06
Mixed bor. & turn.	9.00 to 9.06
Cl'n cast, chem. bor.	13.06 to 14.15*

Truck delivery to foundry

Machinery cast	21.00 to 23.51*
Breakable cast	21.57 to 21.87*
Stove plate	20.00 to 23.51*

DETROIT

Per gross ton, brokers' buying prices:

No. 1 hvy. melting	$17.32*
No. 2 hvy. melting	17.32*
No. 1 bundles	17.32*
New busheling	17.32*
Flashings	17.32*
Mach. shop turn.	$9.00 to 9.50
Short shov. turn.	11.00 to 11.50
Cast iron borings	10.00 to 10.50
Mixed bor. & turn.	9.00 to 9.50
Low phos. plate	19.82*
No. 1 cupola cast	20.00*
Charging box cast	18.00 to 19.00
Hvy. breakable cast	16.50*
Stove plate	18.50 to 19.00
Automotive cast	20.00*

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.75*
No. 2 hvy. melting	18.75*
No. 2 bundles	18.75*
Mach. shop turn.	13.75*
Shoveling turn.	15.75*
Cast iron borings	14.75*
Mixed bor. & turn.	13.75*
No. 1 cupola cast	20.00*
Hvy. breakable cast	16.50*
Cast, charging box	19.00*
Hvy. axle, forge turn.	18.25*
Low phos. plate	21.25*
Low phos. punchings	21.25*
Billet crops	21.25*
RR. steel wheels	23.25*
RR. coil springs	23.25*
RR. malleable	22.00*

ST. LOUIS

Per gross ton delivered to consumer:

Heavy melting	$17.50*
Bundled sheets	17.50*
Mach. shop turn.	$7.00 to 7.50
Hvy. axle turn.	15.50 to 16.00
Locomotive tires, uncut	20.00
Misc. std. sec. rails	19.00*
Rerolling rails	21.00*
Steel angle bars	21.00*
Rails 3 ft. and under	21.50*
RR. springs	22.00*
Steel car axles	23.50*
Stove plate	19.00*
Grate bars	15.25*
Brake shoes	15.25*
RR. malleable	22.00*
Cast iron carwheels	18.50*
No. 1 mach'ery cast	20.00*
Breakable cast	16.50*

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting	$17.00*
No. 2 hvy. melting	17.00*
No. 2 bundles	17.00*
No. 1 busheling	17.00*
Long turnings	$9.50 to 10.00
Cast iron borings	9.50 to 10.00
Bar crops and plate	19.50*
Structural and plate	19.50*
No. 1 cast	20.00*
Stove plate	17.00
Steel axles	18.00*
Scrap rails	18.50
Rerolling rails	20.50*
Angles & splice bars	20.50*
Rails 3 ft. & under	21.00*
Cast iron carwheels	16.50 to 17.00

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. melting	$20.00*
No. 2 hvy. melting	20.00*
Low phos. plate	22.50*
No. 1 busheling	20.00*
Hydraulic bundles	20.00*
Mach. shop turn.	$13.00 to 13.50
Short shovel. turn.	15.00 to 15.50
Cast iron borings	14.00 to 14.50

NEW YORK

Dealers' buying prices per gross ton, on cars

No. 1 hvy. melting	$15.33*
No. 2 hvy. melting	15.33*
Comp. black bundles	15.33*
Comp. galv. bundles	13.33*
Mach. shop turn.	10.33*
Mixed bor. & turn.	10.33*
No. 1 cupola cast	20.00*
Hvy. breakable cast	16.50*
Charging box cast	19.00*
Stove plate	19.00*
Clean auto cast	20.00*
Unstrip. motor blks.	17.50*
Cl'n chem. cast bor.	14.33*

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.25*
No. 1 bundles	19.25*
No. 2 bundles	19.25*
No. 2 hvy. melting	19.25*
Mach. shop turn.	13.00
Shoveling turn.	15.00
Cast iron borings	14.00
Mixed bor. & turn.	13.00
No. 1 cupola cast	20.00*
Stove plate	19.00*
Low phos. plate	21.75*
Scrap rails	20.75*
Rails 3 ft. & under	22.75*
RR. steel wheels	23.75*
Cast iron car wheels	20.00*
RR. coil & leaf spgs.	23.75*
RR. knuckles & coup.	23.75*
RR. malleable	22.00*
No. 1 busheling	19.25*

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50*
No. 2 hvy. melting	19.50*
Compressed sheet stl.	19.50*
Drop forge flashings	19.00*
No. 2 bundles	19.50*
Mach. shop turn.	$12.00 to 12.50
Short shovel.	14.00 to 14.50
No. 1 busheling	19.50*
Steel axle turn.	19.00*
Low phos. billet and bloom crops	24.50*
Cast iron borings	13.00 to 13.50
Mixed bor. & turn.	12.00 to 12.50
No. 2 busheling	17.00*
No. 1 machine cast	20.00*
Railroad cast	20.00*
Railroad grate bars	15.25*
Stove plate	19.00*
RR. hvy. melting	20.50*
Rails 3 ft. & under	23.00*
Rails 18 in. & under	24.25*
Rails for rerolling	23.00*
Railroad malleable	22.00*
Elec. furnace punch	22.00*

SAN FRANCISCO

Per gross ton delivered to consumer:

RR. hvy. melting	$15.50 to $16.25
No. 1 hvy. melting	15.50 to 16.25
No. 2 hvy. melting	14.50 to 15.25
No. 2 bales	13.50 to 14.25
No. 3 bales	9.50 to 10.59
Mach. shop turn.	7.00
Elec. furn. 1 ft., und.	15.50 to 17.00
No. 1 cupola cast	19.00 to 21.00

LOS ANGELES

Per gross ton delivered to consumer:

No. 1 hvy. melting	$14.50 to $15.50
No. 2 hvy. melting	13.50 to 14.50
No. 2 bales	12.50 to 13.50
No. 3 bales	9.00 to 10.00
Mach. shop turn.	4.50
No. 1 cupola cast	19.00 to 21.00

SEATTLE

Per gross ton delivered to consumer:

RR. hvy. melting	$14.50
No. 1 hvy. melting	14.50*
No. 3 bundles	11.50
Elec. furn. 1 ft., und.	17.00
No. 1 cupola cast	20.00*

Comparison of Prices . .

Advances Over Past Week in Heavy Type; Declines in *Italics*. Prices are F.O.B. Major Basing Points. The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 158-166.

Flat Rolled Steel: (Cents Per Lb.)	Apr. 3, 1945	Mar. 27, 1945	Feb. 27, 1945	Apr. 4, 1944
Hot rolled sheets	2.20	2.20	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.65	3.65	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.20	2.20	2.10	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terne Plate: (Dollars Per Base Box)				
Tin plate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tin plate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.80	2.80	2.55	2.55
Rails: (Dollars Per Gross Ton)				
Heavy rails	$43.00	$43.00	$40.00	$40.00
Light rails	43.00	43.00	40.00	40.00
Semi-Finished Steel: (Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs, rerolling	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp	1.90	1.90	1.90	1.90

Latest steel interim price increase authorized by OPA effective Jan. 11, 1945.

Pig Iron: (Per Gross Ton)	Apr. 3, 1945	Mar. 27, 1945	Feb. 27, 1945	Apr. 4, 1944
No. 2 fdy., Philadelphia	$26.84	$26.84	$26.84	$25.84
No. 2, Valley furnace	25.00	25.00	25.00	24.00
No. 2, Southern Cin'ti	26.11	26.11	26.11	23.94
No. 2, Birmingham	21.38	21.38	21.38	20.38
No. 2, foundry, Chicago†	25.00	25.00	25.00	24.00
Basic, del'd eastern Pa.	26.34	26.34	26.34	25.34
Basic, Valley furnace	24.50	24.50	24.50	23.50
Malleable, Chicago†	25.00	25.00	25.00	24.00
Malleable, Valley	25.00	25.00	25.00	24.00
L. S. charcoal, Chicago	37.34	37.34	37.34	37.34
Ferromanganese‡	135.00	135.00	135.00	135.00

† The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡ For carlots at seaboard.
Last pig iron price change authorized by OPA effective Feb. 14, 1945.

Scrap: (Per Gross Ton)				
Heavy melt'g steel, P'gh.	$20.00	$20.00	$20.00	$20.00
Heavy melt'g steel, Phila.	18.75	18.75	18.75	18.75
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	17.32	17.32	17.32	17.85
Low phos. plate, Youngs'n	22.50	22.50	22.50	22.50
No. 1 cast, Pittsburgh	20.00	20.00	20.00	20.00
No. 1 cast, Philadelphia	20.00	20.00	20.00	20.00
No. 1 cast, Chicago	20.00	20.00	20.00	20.00
Coke, Connellsville: (Per Net Ton at Oven)				
Furnace coke, prompt	$7.00	$7.00	$7.00	$7.00
Foundry coke, prompt	8.25	8.25	8.25	8.25
Non-Ferrous Metals: (Cents Per Lb. to Large Buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, Virgin, del'd.	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony, Laredo, Tex.	14.50	14.50	14.50	14.50

Composite Prices . . .

Starting with the issue of April 22, 1943, the weighted finished steel price index was revised for the years 1941, 1942 and 1943. See explanation of the change on page 90 of the April 22, 1943, issue.

	FINISHED STEEL	PIG IRON	SCRAP STEEL
April 3, 1945	2.25839c. a Lb.	$24.61 a Gross Ton	$19.17 a Gross Ton
One week ago	2.25839c. a Lb.	$24.61 a Gross Ton	$19.17 a Gross Ton
One month ago	2.25839c. a Lb.	$24.61 a Gross Ton	$19.17 a Gross Ton
One year ago	2.27235c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton

	FINISHED STEEL HIGH	FINISHED STEEL LOW	PIG IRON HIGH	PIG IRON LOW	SCRAP STEEL HIGH	SCRAP STEEL LOW
1945	2.25839c., Jan. 16	2.21189c., Jan. 2	$24.61, Feb. 20	$23.61, Jan. 2	$19.17	$19.17
1944	2.30837c., Sept. 5	2.21189c., Oct. 5	$23.61	$23.61	19.17	$15.67, Oct. 24
1943	2.25513c.	2.25513c.	23.61	23.61	19.17	19.17
1942	2.26190c.	2.26190c.	23.61	23.61	19.17	19.17
1941	2.43078c.	2.43078c.	$23.61, Mar. 20	$23.45, Jan. 2	$22.00, Jan. 7	$19.17, Apr. 10
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	21.83, Dec. 30	16.04, Apr. 9
1939	2.35367c., Jan. 3	2.26689c., May 16	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.58414c., Mar. 9	2.32263c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.67, June 8
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.95578c., Oct. 3	1.75836c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.89196c., July 5	1.83901c., Mar. 1	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.99626c., Jan. 13	1.86586c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.31773c., May 28	2.26498c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 22, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

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New in Name . . . Old in Experience

Prices of Finished Iron and Steel . . .

Steel prices shown here are f.o.b. basing points, in cents per lb. unless otherwise indicated. Extras apply. Delivered prices do not reflect 3% tax on freight. (1) Mill run sheet, 10c. per 100 lb. under base; primes, 25c. above base. (2) Unassorted commercial coating. (3) Widths up to 12-in. inclusive. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25c. per 100 lb. to fabricators. (8) Also shafting. For quantities of 20,000 to 29,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (12) Boxed. (13) Portland and Seattle price, San Francisco 2.50c. (14) This base price for annealed, bright finish wires, commercial spring wire. (15) Deduct 10c. per 100 lb. for plates not produced to sheared mill or universal mill width and length tolerances.

Basing Point → / Product ↓	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Pacific Ports, Cars [10]	DELIVERED TO Detroit	New York	Philadelphia
SHEETS															
Hot rolled	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.30¢	2.20¢		2.75¢	2.30¢	2.44¢	2.37¢
Cold rolled [1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized (24 gage)	3.65¢	3.65¢	3.65¢		3.65¢	3.65¢	3.65¢	3.65¢	3.75¢	3.65¢		4.20¢		3.89¢	3.82¢
Enameling (20 gage)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢		4.00¢	3.45¢	3.71¢	3.67¢
Long ternes [3]	3.80¢	3.80¢	3.80¢									4.55¢		4.16¢	4.12¢
STRIP															
Hot rolled [3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢	2.46¢	
Cold rolled [4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester=3.00¢)					2 90¢	3.16¢	
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢							2.56¢	
Commodity C-R	2.95¢	3.05¢		2.95¢			2.95¢	(Worcester=3.35¢)					3 05¢	3.31¢	
TIN PLATE															
Standard cokes, base box	$5.00	$5.00	$5.00						$5.10					5.36¢	5.32¢
Electro, box 0.25 lb.	$4.35	$4.35	$4.35												
Electro, box 0.50 lb.	$4.50	$4.50	$4.50						$4.60						
Electro, box 0.75 lb.	$4.65		$4.65						$4.75						
BLACK PLATE															
29 gage [5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢[12]			3.37¢
TERNES, MFG.															
Special coated, base box	$4.30	$4.30	$4.30						$4.40						
BARS															
Carbon steel	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth=2.25¢)			2.50¢	2.80¢	2.25¢	2.49¢	2.47¢
Rail steel [6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.50¢	2.80¢			
Reinforcing (billet) [7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢[13]	2.25¢	2.39¢	
Reinforcing (rail) [7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢	2.55¢[13]	2.25¢		2.47¢
Cold finished [8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢		(Detroit=2.70¢)			(Toledo=2.80¢)			2.99¢	2.97¢
Alloy, hot rolled	2.70¢	2.70¢				2.70¢		(Bethlehem, Massillon, Canton=2.70¢)					2.80¢		
Alloy, cold drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢							3 45¢		
PLATES								(Coatesville and Claymont=2.20¢)							
Carbon steel [15]	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢		2.20¢	2.20¢	2.45¢		2.55¢	2 75¢	2.42¢	2.39¢	2.25¢
Floor plates	3.35¢	3.35¢									3.70¢	4.00¢		3.71¢	3.67¢
Alloy	3.50¢	3.50¢			(Coatesville=3.50¢)						3.95¢	4.15¢		3 70¢	3 59¢
SHAPES															
Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem=2.10¢)			2.45¢	2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R															
0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester=3.00¢)								
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester=4.50¢)								
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester=6.35¢)								
1.01 to 1.25 Carbon	8.35¢			8 35¢			(Worcester=8.55¢)								
WIRE [9]															
Bright [14]	2.60¢	2.60¢		2 60¢	2 60¢		(Worcester=2.70¢)			(Duluth=2.65¢)		3.10¢			2 92¢
Galvanized	Add proper size extra and galvanising extra to Bright Wire base														
Spring (High Carbon)	3.20¢	3.20¢		3.20¢			(Worcester=3.30¢)					3.70¢			3.52¢
PILING															
Steel Sheet	2.40¢	2 40¢				2.40¢						2.95¢			2.72¢

EXCEPTIONS TO PRICE SCHED. NO. 6.

Slabs, per gross ton—Andrews Steel Co. $41 basing pts.; Wheeling Steel Corp. (rerolling) 4 in. sq. or larger $37.75 f.o.b. Portsmouth, Ohio; Empire Sheet & Tin Plate Corp. $41; Phoenix Iron Co. (rerolling) $41, (forging) $47; Granite City Steel $47.50; Kaiser Co. (rerolling) $58.64, (forging) $64.64, f.o.b. Los Angeles.

Blooms, per gross ton—Phoenix Iron Co. (rerolling) $41; (forging) $47; Pgh. Steel Co. (rerolling) $38.25, (forging) $44.25; Wheeling Steel Corp. (rerolling) 4 in. sq. or larger $37.75 f.o.b. Portsmouth; Kaiser Co. (rerolling) $58.64, (forging) $64.64, (shell steel) $74.64 f.o.b. Los Angeles.

Sheet Bar, per gross ton—Empire Sheet & Tin Plate Co. $39 mill; Wheeling Steel Corp. $38 Portsmouth, Ohio.

Billets, Forging, per gross ton—Andrews Steel Co. $50 basing pts.; Follansbee Steel Corp. $49.50 Toronto, Ohio; Phoenix Iron Co. $47 mill; Geneva Steel Co. $64.64 f.o.b. Pacific Coast; Pittsburgh Steel Co. $49.50; Kaiser Co. $64.64, (shell steel) $74.64, f.o.b. Los Angeles.

Billets, Rerolling, per gross ton—Continental Steel Corp. may charge Acme Steel in Chicago switching area $34 plus freight from Kokomo, Ind.; Northwestern Steel & Wire Co. (Lend-Lease) $41 mill; Wheeling Steel Corp. 4 in. sq. or larger $37.75, smaller $39.50 f.o.b. Portsmouth, Ohio; Stanley Works may sell Washburn Wire Co. under allocation at $39 Bridgeport, Conn.; Keystone Steel & Wire Co. may sell Acme Steel Co. at Chicago base, f.o.b. Peoria; Phoenix Iron Co. $41 mill; Continen-

PRICES

tal Steel Corp. (1¾ x 1¾) $39.50, (2 x 2) $40.60 Kokomo, Ind. (these prices include $1 size extra); Keystone Steel & Wire Co. $36.40 Peoria; Connors Steel Co. $50.60 Birmingham; Ford Motor Co. $34 Dearborn, Mich.; Geneva Steel Co. $58.64 f.o.b. Pacific Coast; Pgh. Steel Co. $43.50; Kaiser Co. $58.64 f.o.b. Los Angeles.

Structural Shapes—Phoenix Iron Co. 2.35c. basing pts. (export) 2.50c. Phoenixville; Knoxville Iron Co. 2.30c. basing points; Kaiser Co. 3.20c. f.o.b. Los Angeles.

Rails, per gross ton—Sweet Steel Co. (rail steel) $50 mill; West Virginia Rail Co. (lightweight) on allocation based Huntington, W. Va.; Colorado Fuel & Iron Corp., $45 Pueblo.

Hot Rolled Plate—Granite City Steel Co. 2.65c. mill; Knoxville Iron Co. 2.25c. basing pts.; Kaiser Co. and Geneva Steel Co. 3.20c. Pacific Ports; Central Iron and Steel Co. 2.50c. basing points; Granite City Steel Co. 2.35c. Granite City.

Merchant Bars—W. Ames Co., 10 tons and over, 2.85c. mill; Eckels-Nye Steel Corp. 2.50c. basing pts. (rail steel) 2.40c.; Phoenix Iron Co. 2.40c. basing pts.; Sweet Steel Co. (rail steel) 2.33c. mill; Joslyn Mfg. & Supply Co., 2.35c. Chicago; Calumet Steel Div., Borg Warner Corp. (8 in. mill bar), 2.35c. Chicago; Knoxville Iron Co., 2.30c. basing pts.; Laclede Steel Co., sales to LaSalle Steel granted Chicago base, f.o.b. Madison, Ill.; Milton Mfg. Co., 2.75c. f.o.b. Milton, Pa.

Pipe Skelp—Wheeling Steel Corp., Benwood, 2.05c.

Reinforcing Bars—W. Ames & Co., 10 tons and over, 2.85c. mill; Sweet Steel Co. (rail steel), 2.33c. mill; Columbia Steel Co., 2.50c. Pacific Ports.

Cold Finished Bars—Keystone Drawn Steel Co. on allocation, Pittsburgh c.f. base plus c/l freight on hot rolled bars Pittsburgh to Spring City, Pa.; New Engand Drawn Steel Co. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to Mansfield, Mass., f.o.b. Mansfield; Empire Finished Steel Corp. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to plants, f.o.b. plant; Compressed Steel Shafting Co. on allocation outside New England, Buffalo base plus c/l freight Buffalo to Readville, Mass. f.o.b. Readville; Medart Co. in certain areas, Chicago c.f. base plus c/l freight Chicago to St. Louis, f.o.b. St. Louis.

Alloy Bars—Texas Steel Co., for delivery except Texas and Okla., Chicago base, f.o.b. Fort Worth, Tex.; Connors Steel Co., shipped outside Ala., Mississippi, Louisiana, Georgia, Florida, Tenn., Pittsburgh base, f.o.b. Birmingham.

Hot Rolled Strip—Joslyn Mfg. & Supply Co., 2.30c. Chicago; Knoxville Iron Co., 2.25c. basing pts.

Hot Rolled Sheets—Andrews Steel Co., Middletown base on shipments to Detroit or area; Parkersburg Iron & Steel Co., 2.25c. Parkersburg.

Galvanized Sheets—Andrews Steel Co. 3.75c. basing pts.; Parkersburg Iron & Steel Co., 3.85c. Parkersburg; Apollo Steel Co., 3.75c. basing pts.; Continental Steel Co., Middletown base on Kokomo, Ind., product; Superior Sheet Steel Co., Pittsburgh base except for Lend-Lease.

Pipe and Tubing—South Chester Tube Co. when priced at Pittsburgh, freight to Gulf Coast and Pacific Ports may be charged from Chester, Pa., also to points lying west of Harrisburg, Pa.

Black Sheets—Empire Sheet and Tinplate Co., maximum base price mill is 2.45c. per 100 lb., with differentials, transportation charges, etc., provided in RPS. No. 6.

Wire Products—Pittsburgh Steel Co., f.o.b. Pittsburgh, per 100 lb., rods, No. 5 to 9/32 in., 2.20c.; rods, heavier than 9/32, 2.35c.; bright wire, 2.725c.; bright nails, 2.90c.; lead and furnace annealed wire, 2.85c.; pot annealed wire, 2.85c.; galvanized barbed wire, 3.90c.; plain staples, 2.55c.; galvanized staples, 2.65c.; bright spring wire, 3.30c.; galvanized spring wire, 3.45c.

Mr. Ug led a hard life in many ways—but he had the advantage over you in one respect. He didn't have to worry about keeping metals clean!

You can make that job easier, though, by using Wyandotte Metal Cleaners. One of these specialized, labor-saving products will meet almost any metal cleaning need—for cleaning after machining and prior to plating, painting, lacquering, blackening, anodizing or spot welding.

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WYANDOTTE, MICHIGAN • Service Representatives in 88 Cities

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendment to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 8617-20	Hot Rolled, NE 9442-45 Ann.	Cold Drawn, NE 8617-20	Cold Drawn, NE 9442-45 Ann.
**Philadelphia	$3.618	$4.872[8]	$5.168a	$3.922	$4.772	$3.705	$3.666	$3.822	$4.072	$5.966	$7.066	$7.272	$8.322
New York	3.690	4.613[3]	5.160	3.974[6]	4.772	3.868	3.758	3.853	4.103	6.008	7.108	7.303	8.353
Boston	3.844	4.744[9]	5.374[9]	4.106	4.715	4.012	3.912	4.044	4.144	6.162	7.262	7.344	8.394
Baltimore	3.494	4.852	5.044	3.902	4.752	3.694	3.759	3.802	4.052	....	....	....	....
Norfolk	3.871	4.965	5.521	4.165	4.865	4.071	4.002	4.065	4.165	....	....	....	....
Chicago	3.35	4.20	5.381	3.60	4.65[17]	3.65	3.55	3.50	3.75	5.75	6.85	6.85	7.90
Milwaukee	3.487	4.337[3]	5.422[4]	3.737	4.787[17]	3.787	3.687	3.637	3.887	5.987	7.087	7.087	8.137
Cleveland	3.45	4.40	5.027[4]	3.60	4.45	3.50	3.388	3.35	3.75	5.956	7.056	6.85	7.90
Buffalo	3.45	4.40	4.904	3.819	4.669	3.73	3.40	3.35	3.75	5.75	6.85	6.85	7.90
Detroit	3.55	4.50	5.154	3.70	4.689[17]	3.709	3.661	3.45	3.80	6.08	7.18	7.159	8.209
Cincinnati	3.525	4.475[3]	4.975[5]	3.675	4.711	3.711	3.691	3.611	4.011	....	....	....	....
St. Louis	3.497	4.347[3]	5.322[4]	3.747	4.931[17]	3.797	3.697	3.647	4.031	6.131	7.231	7.231	8.281
Pittsburgh	3.45	4.40	4.90	3.60	4.45	3.50	3.40	3.35	3.75	5.75	6.85	6.85	7.90
St. Paul	3.61	4.48	5.407[4]	3.86	4.35[17]	3.911[3]	3.811[3]	3.761[3]	4.361	6.09	7.19	7.561	8.711
Omaha	3.965	5.443	5.758[4]	4.215	....	4.265	4.165	4.115	4.43	....	....	....	....
Indianapolis	3.68	3.58	4.718	4.918	3.768	4.88	3.63	3.58	3.98	6.08	7.18	7.18	8.23
Birmingham	3.55	....	4.90	3.70	....	3.65	3.55	3.50	4.43	....	....	....	....
Memphis	4.065[7]	4.66	3.415	4.215	....	4.165	4.065	4.015	4.33	....	....	....	....
New Orleans	4.158*	4.95	5.508	4.308	....	4.258	4.158*	4.108*	4.629	....	....	....	....
Houston	3.863	5.573	6.463[1]	4.313	....	4.35	4.25	3.75	6.373[3]	7.223	8.323	8.323	9.373
Los Angeles	5.10	7.20[3]	6.254	4.95	5.613[18]	5.05	4.85	4.40	5.583	8.304	9.404	9.404	10.454
San Francisco	4.65[14]	7.304	6.504	4.50[14]	7.333[17]	4.75[14]	4.35[14]	4.15[14]	5.333	8.304	9.404	9.404	10.454
Seattle	4.75[12]	7.054	6.104	4.25[12]	....	4.85[12]	4.45[12]	4.35[12]	5.783	....	9.404	....	....
Portland	4.75[11]	6.604	5.904	4.75[11]	....	4.85[11]	4.45[11]	4.45[11]	5.533	8.304	9.404	8.304	9.404
Salt Lake City	4.63[17]	....	6.321[8]	5.53[17]	....	5.08[17]	4.98[17]	4.88[17]	5.90	....	....	....	....

National Emergency Steels

MILL EXTRAS

Designation	Basic Open-Hearth		Electric Furnace		Designation	Basic Open-Hearth		Electric Furnace	
	Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs		Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs
NE 8612	0.65¢	$13.00	$1.15	$23.00	NE 9427	0.75¢	$15.00	$1.25	$25.00
NE 8615	0.65	13.00	1.15	23.00	NE 9430	0.75	15.00	1.25	25.00
NE 8617	0.65	13.00	1.15	23.00	NE 9432	0.75	15.00	1.25	25.00
NE 8620	0.65	13.00	1.15	23.00	NE 9435	0.75	15.00	1.25	25.00
NE 8622	0.65	13.00	1.15	23.00	NE 9437	0.75	15.00	1.25	25.00
NE 8625	0.65	13.00	1.15	23.00	NE 9440	0.75	15.00	1.25	25.00
NE 8627	0.65	13.00	1.15	23.00	NE 9442	0.80	16.00	1.30	26.00
NE 8630	0.65	13.00	1.15	23.00	NE 9445	0.80	16.00	1.30	26.00
NE 8632	0.65	13.00	1.15	23.00	NE 9447	0.80	16.00	1.30	26.00
NE 8635	0.65	13.00	1.15	23.00	NE 9450	0.80	16.00	1.30	26.00
NE 8637	0.65	13.00	1.15	23.00					
NE 8640	0.65	13.00	1.15	23.00					
NE 8642	0.65	13.00	1.15	23.00	NE 9722	0.65	13.00	1.15	23.00
NE 8645	0.65	13.00	1.15	23.00	NE 9727	0.65	13.00	1.15	23.00
NE 8647	0.65	13.00	1.15	23.00	NE 9732	0.65	13.00	1.15	23.00
NE 8650	0.65	13.00	1.15	23.00	NE 9737	0.65	13.00	1.15	23.00
					NE 9742	0.65	13.00	1.15	23.00
NE 8712	0.70	14.00	1.20	24.00	NE 9745	0.65	13.00	1.15	23.00
NE 8715	0.70	14.00	1.20	24.00	NE 9747	0.65	13.00	1.15	23.00
NE 8717	0.70	14.00	1.20	24.00	NE 9750	0.65	13.00	1.15	23.00
NE 8720	0.70	14.00	1.20	24.00	NE 9763	0.65	13.00	1.15	23.00
NE 8722	0.70	14.00	1.20	24.00	NE 9768	0.65	13.00	1.15	23.00
NE 8725	0.70	14.00	1.20	24.00					
NE 8727	0.70	14.00	1.20	24.00	NE 9830	1.30	26.00	1.80	36.00
NE 8730	0.70	14.00	1.20	24.00	NE 9832	1.30	26.00	1.80	36.00
NE 8732	0.70	14.00	1.20	24.00	NE 9935	1.30	26.00	1.80	36.00
NE 8735	0.70	14.00	1.20	24.00	NE 9837	1.30	26.00	1.80	36.00
NE 8737	0.70	14.00	1.20	24.00	NE 9840	1.30	26.00	1.80	36.00
NE 8740	0.70	14.00	1.20	24.00	NE 9842	1.30	26.00	1.80	36.00
NE 8742	0.70	14.00	1.20	24.00	NE 9845	1.30	26.00	1.80	36.00
NE 8745	0.70	14.00	1.20	24.00	NE 9847	1.30	26.00	1.80	36.00
NE 8747	0.70	14.00	1.20	24.00	NE 9850	1.30	26.00	1.80	36.00
NE 8750	0.70	14.00	1.20	24.00					
					NE 9912	1.20	24.00	1.55	31.00
NE 9415	0.75	15.00	1.25	25.00	NE 9915	1.20	24.00	1.55	31.00
NE 9417	0.75	15.00	1.25	25.00	NE 9917	1.20	24.00	1.55	31.00
NE 9420	0.75	15.00	1.25	25.00	NE 9920	1.20	24.00	1.55	31.00
NE 9422	0.75	15.00	1.25	25.00	NE 9922	1.20	24.00	1.55	31.00
NE 9425	0.75	15.00	1.25	25.00	NE 9925	1.20	24.00	1.55	31.00

Note 1: The ranges shown are restricted to sizes 100 sq. in. or less or equivalent cross-sectional area 18 in. wide or under, with a maximum individual piece weight of 7000 lb. irrespective of size. **Note 2:** For steels ordered to such ranges, below the size and weight restriction, the average of all the chemical checks must be within the limits specified subject to check analysis variations given in Table 4, Section 10, AISI Steel Products Manual. **Note 3:** When acid open-hearth is specified and acceptable, add to basic open-hearth alloy differential 0.25c. per lb. for bars and bar strip and $5 per gross ton for billets, blooms and slabs. **Note 4:** The extras shown are in addition to the base price of $2.70 for 100 lb. on finished products and $54 per gross ton on semi-finished steel, major basing points, and are in cents per pound when applicable to bars and bar-strip and in dollars per gross ton when applicable to billets, blooms and slabs. The full extra applicable over the base price is the total of all extras indicated by the specific requirements of the order. The higher extra shall be charged for any size falling between two published extras.

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1499 lb.; strip, extras on all quantities; bars, 1500 lb. base; NE alloy bars, 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 199 lb. (7) 400 to 1499 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb. and over. (15) 1000 lb. and over. (16) 1500 lb. and over. (17) 2000 lb. and over. (18) 3500 lb. and over.

(a) Philadelphia: Galvanized sheet, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

*Add 0.271c. for sizes not rolled in Birmingham.

**City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

LAKE SUPERIOR ORES

(51.50% *Fe, Natural Content, Delivered Lower Lake Ports**)

Per Gross Ton

Old range, bessemer, 51.50	$4.75
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phosphorus, 51.50	4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Effective CaF_2 Content:	*Base price per short ton*
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

PRICES

SEMI-FINISHED STEEL

Ingots, Carbon, Rerolling

Base per gross ton, f.o.b. mill.... $31.00
Exceptions: Phoenix Iron Co. may charge $38.75; Kaiser Co., $43.00 f.o.b. Pacific Coast ports; Empire Sheet & Tinplate Co., $34.25; Pgh. Steel Co., $33.10.

Ingots, Carbon, Forging

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown $36.00
Exceptions: Phoenix Iron Co. may charge $43.00; Empire Sheet & Tinplate Co., $39.25, f.o.b. Mansfield, Ohio; West Coast producers, $48.00, f.o.b. Pacific Coast Ports; Pgh. Steel Co., $38.10.

Ingots, Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Coatesville, Chicago, Massillon, Pittsburgh $45.00
Exceptions: C/L delivered Detroit add $2.00; delivered East Michigan add $3.00. Connors Steel Co. may charge $45.00 f.o.b. Birmingham.

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.00 higher; delivered E. Michigan, $3 higher; f.o.b. Duluth, billets only, $2.00 higher; billets f.o.b. Pacific ports are $12 higher. Provo, $11.20 higher. Delivered prices do not reflect three per cent tax on freight rates.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

For exceptions on semi-finished steel see the footnote on the page of finished steel prices.

Alloy Billets, Blooms, Slabs

Pittsburgh, Chicago, Canton, Massillon, Buffalo or Bethlehem, per gross ton $54.00
Price delivered Detroit $2.00 higher; East Michigan, $3.00 higher.

Shell Steel

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.
Prices delivered Detroit are $2.00 higher; East Michigan, $3 higher.
Price Exception: Follansbee Steel Corp. permitted to sell at $13.00 per gross ton, f.o.b. Toronto, Ohio, above base price of $52.00.
Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(*No. 5 to 9/32 in.*)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

TOOL STEEL

(*F.o.b. Pittsburgh, Bethlehem, Syracuse*)

	Base per lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi 3c. higher.

Fast **Tough**

Heavy feed at high speed!

Heavy feed at high speed spells doom to the ordinary hack saw blade; down-time for your machine, extra expense in money, man hours, and production. The MARVEL Hack Saw Blade, because it is positively *unbreakable* under these conditions, should be "a must" tool in every efficiently operated shop. A tough alloy steel back is electrically welded to high speed steel teeth, producing a blade that can be pulled to almost unlimited tension; can withstand extra heavy feeds and the heat and abrasion of high speed heavy duty sawing.

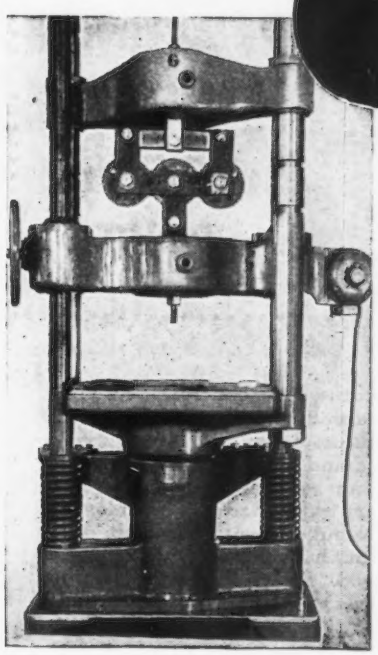
The same exclusive *unbreakable* feature of MARVEL Hack Saw Blades is also a feature of MARVEL Hole Saws, giving these saws the ability to stand up under abuse. MARVEL Hole Saws cut holes from ⅝" to 4½" diameter in stock up to 1⅛" thick. Usable in portable drill, drill press, or lathe tail stock.

Complete Range of Metal Sawing Machines

Being the largest exclusive manufacturer of metal sawing machines and blades, both hack saw and band saw type, we have the correct answer to your cut-off problems. Each MARVEL model has a distinct application, so write us and we will send our catalog, price, and recommendation for the saw to fill your requirements most efficiently. MARVEL sawing engineers are also available to discuss and analyze your cut-off work. (Without obligation of course)

ARMSTRONG-BLUM MFG. CO.
5700 W. Bloomingdale Ave., Chicago 39, Illinois, U. S. A.

CHECKED FOR *Static Strength*



You can judge gears by the standards set for their inspection.

At Fairfield's, the machine testing *static strength* uses three gears, the two outside gears being pulled up and the center gear down. All gears are accurately held on correct center distances and, by means of a bright light and a magnifying glass, the teeth are watched as the load increases steadily up to the breaking point. After a tooth failure, the gears are rotated and test repeated. The method is valuable in comparing the strength of various materials and methods of heat treating, and provides a basis for studying the effect of velocity on gear strength.

Gear processing service by Fairfield is supported by extensive, modern facilities and *25 years of experience*. Write for our brochure on gears.

FAIRFIELD MFG. CO.
305 So. Earl Avenue
Lafayette, Ind.

MADE TO ORDER
Hypoid, Helical, Herringbone, Spur, Spiral Bevel, Straight Bevel, Worm and Zerol Gears; also, complete Differentials and various Splined Shafts.

ARMY E NAVY
FAIRFIELD for FINE GEARS

To produce the highest quality of perforated metal as used in the industrial arts and for ornamentation has been the ambition and persistent endeavor of this company. The highest quality best serves the user. We are here to serve you.

ANY METAL • ANY PERFORATION

The Harrington & King PERFORATING CO.

5657 FILLMORE STREET—CHICAGO 44, ILL.
Eastern Office, 114 Liberty Street, New York 6, N. Y.

SMOOTH ACTING CONTROL OF AIR POWER

With Hannifin "Packless" Air Control Valves you get the smooth acting, positive control of air operated equipment that means better performance and maximum use of air power. Disc-type design, with the bronze disc ground and lapped to make a perfect seal with the seat, does away with packing, provides lasting leak-proof operation and smooth acting control.

Hannifin Air Control Valves are made in 3-way and 4-way types, hand and foot operated, manifold, spring return, and heavy duty rotary types. Write for cylinder and valve bulletin with complete data. Hannifin Manufacturing Company, 621-631 South Kolmar Avenue, Chicago 24, Illinois.

Hannifin
AIR CONTROL VALVES

PRICES

WELDED PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills
(F.o.b. Pittsburgh only on wrought pipe)
Base Price—$200.00 per Net Ton

	Black	Galv.
Steel (Butt Weld)		
½ in.	63½	51
¾ in.	66½	55
1 to 3 in.	68½	57½
Wrought Iron (Butt Weld)		
½ in.	24	3½
¾ in.	30	10
1 and 1¼ in.	34	16
1½ in.	38	18½
2 in.	37½	18
Steel (Lap Weld)		
2 in.	61	49½
2½ in. and 3 in.	64	52½
3½ to 6 in.	66	54½
Wrought Iron (Lap Weld)		
2 in.	30½	12
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17
Steel (Butt, extra strong, plain ends)		
½ in.	61½	50½
¾ in.	65½	54½
1 to 3 in.	67	57
Wrought Iron (Same as Above)		
½ in.	25	6
¾ in.	31	12
1 to 2 in.	38	19½
Steel (Lap, extra strong, plain ends)		
2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56
Wrought Iron (Same as Above)		
2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher on all butt weld.

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.20
6 in. and larger, Birmingham	46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles	69.40
6-in. and larger f.o.b. cars, Seattle	71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger are $45 at Birmingham and $53.80 delivered Chicago, $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle. Delivered prices do not reflect new 3 per cent tax on freight rates.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes, Minimum Wall. Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots.

	Seamless Cold Drawn	*Seamless Hot Rolled*	*Lap Weld, Hot Rolled*
2 in. o.d. 13 B.W.G.	15.03	13.04	12.38
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.58
3 in. o.d. 12 B.W.G.	22.48	19.50	18.35
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.15
4 in. o.d. 10 B.W.G.	35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb. or ft. and over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

PRICES

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	Pacific Coast Basing Points†
	Base per Keg	
Standard wire nails	$2.80	$3.30
Coated nails	2.80	3.30
Cut nails, carloads	3.85	....
	Base per 100 lb.	
Annealed fence wire	$3.05	$3.55
Annealed galv. fence wire	3.40	3.90
	Base Column	
Woven wire fence*	.67	.35
Fence posts, carloads	.69	.86
Single loop bale ties	.59	.84
Galvanized barbed wire**	.70	.80
Twisted barbless wire	.70	....

*15½ gage and heavier. **On 80-rod spools in carload quantities.

†Prices subject to switching or transportation charges.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:

Base discount less case lots

	Per Cent Off List
½ in. & smaller x 6 in. & shorter	65½
3/16 & 5/16 in. x 6 in. & shorter	63½
¾ to 1 in. x 6 in. shorter	61
1½ in. and larger, all lengths	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed:

(Hexagon or Square)

½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	U.S.S.	S.A.E.
Base discount less keg lots		
7/16 in. and smaller	..	64
½ in. and smaller	62	..
½ in. through 1 in.	..	60
9/16 in. through 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full keg lots, 10 per cent additional discount.

Stove Bolts

	Consumer
Packages, nuts loose	71 and 10
In packages, with nuts attached	71
In bulk	80

On stove bolts freight allowed up to 35c. per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets

(½ in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets

(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 5

Cap and Set Screws	*Consumer Per Cent Off List*
Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in.	20x28 in.
3-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00

LEE

Quality Springs

ALL SHAPES · ALL SIZES · ALL MATERIALS

LEE SPRING COMPANY, Inc.

30 MAIN STREET BROOKLYN, N.Y.

LEE-BUILT TRADE MARK SPRINGS

HEAT-TREATED STEEL SHOT

We manufacture shot and grit for endurance

A shot or grit that will blast fast with a clean finish.

This is the only reason why so many operators are daily changing to our shot and grit, from Maine to California.

The unprecedented demand for our—

Heat-Treated Steel Shot and Heat-Treated Steel Grit

has enabled us to expand our production and maintain a quality that is more than satisfactory to our hundreds of customers all over the country.

HARRISON ABRASIVE CORPORATION

Manchester, New Hampshire

HEAT-TREATED STEEL GRIT

PIG IRON

All prices set in bold face type are maximums established by OPA as of February 14, 1945. Other domestic prices (in italics) are delivered quotations per gross ton computed on the basis of the official maximum. Delivered prices do not reflect 3 per cent tax on freight rates.

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phosphorus	Charcoal
Boston	*$26.50*	*$26.00*	*$27.50*	*$27.00*	.....	.....
Brooklyn	*28.50*	*28.00*	.....	*29.00*	.....	.....
Jersey City	*27.53*	*27.03*	*28.53*	*28.03*	.....	.....
Philadelphia	*26.84*	*26.34*	*27.84*	*27.34*	*$31.74*	.....
Bethlehem	$26.00	$25.50	$27.00	$26.50	.....	.....
Everett, Mass.	26.00	25.50	27.00	26.50	.....	.....
Swedeland, Pa.	26.00	25.50	27.00	26.50	.....	.....
Steelton, Pa.	.....	25.50	.....	.....	$30.50	.....
Birdsboro, Pa.	26.00	25.50	27.00	26.50	30.50	.....
Sparrows Point, Md.	26.00	25.50	.....	.....	.....	.....
Erie, Pa.	25.00	24.50	26.00	25.50	.....	.....
Neville Island, Pa.	25.00	24.50	25.50	25.00	.....	.....
Sharpesville, Pa. (1)	25.00	24.50	25.50	25.00	.....	.....
Buffalo	25.00	24.00	26.00	25.50	30.50	.....
Cincinnati, Ohio	*25.44*	*25.61*	.....	*26.11*	.....	.....
Canton, Ohio	*26.39*	*25.89*	*26.89*	*26.39*	*33.69*	.....
Mansfield, Ohio	*26.94*	*26.44*	*27.44*	*26.94*	*33.86*	.....
St. Louis	*25.50*	*25.00*	.....	.....	.....	.....
Chicago	25.00	24.50	25.50	25.00	*36.46*	..... *$37.34*
Granite City, Ill.	25.00	24.50	25.50	25.00	.....	.....
Cleveland	25.00	24.50	25.50	25.00	*33.42*	.....
Hamilton, Ohio	25.00	24.50	.....	25.00	.....	.....
Toledo	25.00	24.50	25.50	25.00	.....	.....
Youngstown	25.00	24.50	25.50	25.00	*33.42*	.....
Detroit	25.00	24.50	25.50	25.00	.....	.....
Lake Superior, fc.	.....	.....	.....	.....	.....	34.00
Lyles, Tenn., fc. (2)	.....	.....	.....	.....	.....	33.00
St. Paul	*27.63*	27.13	*28.13*	*27.63*	*38.69*	.....
Duluth	25.50	25.00	26.00	25.50	.....	.....
Birmingham	21.38	20.00	26.00	.....	.....	.....
Los Angeles	*27.95*	....	.....	.....	.....	.....
San Francisco	*27.95*	....	.....	.....	.....	.....
Seattle	*27.95*	....	.....	.....	.....	.....
Provo, Utah	23.00	22.50	.....	.....	.....	.....
Montreal	*27.50*	*27.50*	.....	*28.00*	.....	.....
Toronto	*25.50*	*25.50*	.....	*26.00*	.....	.....

GRAY FORGE IRON: Valley or Pittsburgh furnace..... $24.50

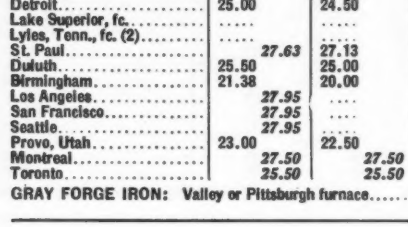
(1) Struthers Iron & Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable.

(2) Price shown is for low-phosphorus iron; high phosphorus sells for $28.50 at the furnace.

Basing point prices are subject to switching charges; Silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 to 2.25 per cent); Phosphorus differentials, a reduction of 38c. per ton for phosphorus content of 0.70 per cent and over; Manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and $1 per ton extra for each additional 0.25 per cent nickel.

Safe Welding

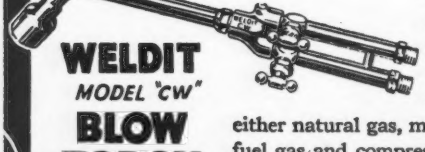
AT LOWER PRODUCTION COSTS



The Weldit Gasaver shuts off the welding flame when not in use. . . . Conserves essential materials by cutting oxygen and acetylene consumption as much as *fifty* per cent. Prevents injury to workmen—or sudden fires—from dangerous idle torch flames. . . . Adjustment remains unaltered between welds.

When the Weldit Gasaver has been installed, you simply hang idle torch on the handy lever rod. Weight of torch pulls rod down, thus automatically shutting off supply lines. Relight instantly by passing torch over Gasaver pilot light. No bother. . . . No time lost. . . . *No readjusting required.* . . . Price $10.00 at Detroit. Order today.

Better Soldering, Annealing and Heating Jobs



The Weldit Model CW Blowpipe is in daily use by many foremost industrial plants. . . . Built in accordance with the recommendations of leading fabricators of sheet metal products. . . . Operates on either natural gas, manufactured gas, or other low temperature fuel gas and compressed air. Stands up under rough shop use. . . . Send for literature.

WELDIT ACETYLENE CO.
641 BAGLEY AVENUE • DETROIT 26, MICH.

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, c. per lb., ton lots.

Copper, electrolytic, 150 and 200 mesh	21½ to 23½c.
Copper, reduced, 150 and 200 mesh	20½ to 25½c.
Iron, commercial, 100 and 200 mesh 96 + % Fe	13½ to 15c.
Iron, crushed, 200 mesh and finer, 90 + % Fe, carload lots	4c.
Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe, drum lots	63c.
Iron, electrolytic, unannealed, 300 mesh and coarser, 99 + % Fe	30 to 33c.
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe	42c.
Iron, carbonyl, 300 mesh and finer, 98-99.8 + % Fe	90c.
Aluminum, 100 and 200 mesh	*23 to 27c.
Antimony, 100 mesh	20.6c.
Cadmium, 100 mesh	$1
Chromium, 150 mesh	$1.03
Lead, 100, 200 & 300 mesh	11½ to 12½c.
Manganese, 150 mesh	51c.
Nickel, 150 mesh	51½c.
Solder powder, 100 mesh	8½c. plus metal
Tin, 100 mesh	58¾c.
Tungsten metal powder, 98%-99%, any quantity, per lb.	$2.60
Molybdenum powder, 99%, in 200-lb. kegs, f.o.b. York, Pa., per. lb.	$2.60
Under 100 lb.	$3.00

*Freight allowed east of Mississippi.

COKE

Furnace, beehive (f.o.b. oven)	Net Ton
Connellsville, Pa.	$7.00*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.	8.10
Connellsville, Pa.	8.25
Foundry, By-Product	
Chicago, del'd	13.35
Chicago, f.o.b.	12.60
New England, del'd	14.25
Kearny, N. J., f.o.b.	12.65
Philadelphia, del'd	12.88
Buffalo, del'd	13.00
Portsmouth, Ohio, f.o.b.	11.10
Painesville, Ohio, f.o.b.	11.75
Erie, del'd	12.75
Cleveland, del'd	12.80
Cincinnati, del'd	12.85
St. Louis, del'd	13.35
Birmingham, del'd	10.50

*Hand drawn ovens using trucked coal permitted to charge $7.75 per ton plus transportation charges.

PRICES

REFRACTORIES
(F.o.b. Works)

Fire Clay Brick

	Per 1000
Super-duty brick, St. Louis	$66.55
First quality, Pa., Md., Ky., Mo., Ill.	52.85
First quality, New Jersey	57.70
Sec. quality, Pa., Md., Ky., Mo., Ill.	47.95
Sec. quality, New Jersey	52.55
No. 1 Ohio	44.30
Ground fire clay, net ton	7.80

Silica Brick

Pennsylvania and Birmingham	$52.85
Chicago District	60.65
Silica cement, net ton (Eastern)	9.25

Chrome Brick

	Per Net Ton
Standard chemically bonded, Balt., Plymouth Meeting, Chester	$54.00

Magnesite Brick

Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00

Grain Magnesite

Domestic, f.o.b. Balt. and Chester in sacks (carloads)	$43.48
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

RAILS, TRACK SUPPLIES
(F.o.b. Mill)

Standard rails, heavier than 60 lb., No. 1 O.H., gross ton	$43.00
Angle splice bars, 100 lb.	2.70
(F.o.b. Basing Points)	*Per Gross Ton*
Light rails (from billets)	$43.00
Light rails (from rail steel)	39.00
	Base per Lb.
Cut spikes	3.00c.
Screw spikes	5.15c.
Tie plate, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25c.

CORROSION AND HEAT-RESISTING STEEL
(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	33.50c.	31.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	24.00c.	35.00c.
Cold strip	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

ELECTRICAL SHEETS
(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

THERE'S MORE TO A SHACKLE THAN SIZE AND TYPE

• It takes more engineering than you might think to make really good shackles. We know, because we've been making good shackles for years. And, every once in a while, we find a way to make them even better.

ACCO SHACKLES are forged from fine grain steel which has superior forging qualities—a steel which can be depended upon for uniform product with uniform tensile strength.

All ACCO SHACKLES are forged in solid dies. Most sizes are drop-forged already bent. This also insures greater uniformity.

Every shackle is rigidly inspected. Special lights enable inspectors to see even the smallest defect. It is almost impossible for a faulty shackle to get by ACCO inspectors.

In shackles with a screw pin, the pin is drop-forged and accurately threaded for continued easy operation.

ACCO SHACKLES, are made to do their job—better.

ACCO SHACKLES are made in both chain and anchor type—of material from 1/4 inch to 2 inches—with round pin or screw pin—finished self-colored, blacked or galvanized—shipped in kegs or barrels, depending on quantity.

ACCO

York, Pa., Boston, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Portland

AMERICAN CHAIN DIVISION
AMERICAN CHAIN & CABLE · BRIDGEPORT

In Business for Your Safety

Ferromanganese

78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Bethlehem, Philadelphia, New York, Birmingham, Rockdale Rockwood, Tenn.

Carload lots (bulk) $135.00
Carload lots (packed) 141.00
Less ton lots (packed) 148.50

$1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Manganese Metal

Contract basis, lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Spot sales add 2c. per lb.

96-98% Mn, .2% max. C, 1% max. Si, 2% max. Fe.
Carload, bulk ..... 36c.
L.c.l. lots ..... 38c.

95-97% Mn, .2% max. C, 1.5% max. Si, 2.5% max. Fe.
Carload, bulk ..... 34c.
L.c.l. lots ..... 35c.

Spiegeleisen

Maximum base, contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Carloads	$35.00	$36.00
Less ton	47.50	48.50

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carloads, f.o.b. shipping point with freight allowed.

	Eastern Zone	Central Zone	Western Zone
50% Si ...	6.65c.	7.10c.	7.25c.
75% Si ...	8.05c.	8.20c.	8.75c.
80-90% Si.	8.90c.	9.05c.	9.55c.
90-95% Si.	11.05c.	11.20c.	11.65c.

Spot sales add: 45c. per lb. for 50% Si, .3c. per lb. for 75% Si, .25c. per lb. for 80-90% and 90-95% Si.

Silvery Iron

(*C/L, Per Gross Ton, base 6.00 to 6.50 Si*)

F.o.b. Jackson, Ohio $30.50
Buffalo 31.75

For each additional 0.50% silicon add $1 a ton. For each 0.50% manganese over 1% add 50c. a ton. Add $1 a ton for 0.75% phosphorus or over.

Bessemer Ferrosilicon

Prices are $1 a ton above silvery iron quotations of comparable analysis.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb., packed. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe..	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe..	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% Si. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	3.35c.	3.50c.	3.65c.
2000 lb.-carload	3.8c.	4.2c.	4.25c.

Silicomanganese

Contract basis lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Add .25c. for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C.

Carload, bulk ..... 6.05c.
2000 lb. to carload ..... 6.70c.
Under 2000 lb. ..... 6.90c.
Briquets, contract, basis carlots, bulk freight allowed, per lb. ... 5.80c.
2000 lb. to carload ..... 6.30c.
Less ton lots ..... 6.55c.

Ferrochrome

(*65-72% Cr, 2% max. Si*)

OPA maximum base contract prices per lb. of contained Cr, lump size in carload lots, f.o.b. shipping point, freight allowed to destination. Add .25c. per lb. contained Cr for spot sales.

	Eastern Zone	Central Zone	Western Zone
0.06% C	23.00c.	23.40c.	24.00c.
0.10% C	22.50c.	22.90c.	23.50c.
0.15% C	22.00c.	22.40c.	23.00c.
0.20% C	21.50c.	21.90c.	22.50c.
0.50% C	21.00c.	21.40c.	22.00c.
1.00% C	20.50c.	20.90c.	21.50c.
2.00% C	19.50c.	19.90c.	21.00c.
66-71% Cr, 4-10% C	13.00c.	13.40c.	14.00c.
62-66% Cr, 5-7% C	13.50c.	13.90c.	14.50c.

High-Nitrogen Ferrochrome

Low-carbon type: 67-72% Cr, 0.75% N. Add 2c. per lb. to regular low-carbon ferrochrome price schedule. Add 2c. for each additional 0.25% N. High-carbon type: 66-71% Cr, 4-5% C, 0.75% N. Add 5c. per lb. to regular high-carbon ferrochrome price schedule.

Low-Carbon Ferromanganese

Contract prices per lb. of manganese contained, lump size, f.o.b. shipping point, freight allowed to destination, Eastern Zone. Add 0.25c. for spot sales.

	Carloads, Bulk	Ton Lots	Less Ton
0.10% max. C, 1 or 2% max. Si	23.00c.	23.40c.	23.65c.
0.15% max. C, 1 or 2% max. Si	22.00c.	22.40c.	22.65c.
0.30% max. C, 1 or 2% max. Si	21.00c.	21.40c.	21.65c.
0.50% max. C, 1 or 2% max. Si	20.00c.	20.40c.	20.65c.
0.75% max. C, 7.00% max. Si	16.00c.	16.40c.	16.65c.

Ferrochrome Briquets

Contract prices per lb. of briquet, f.o.b. shipping point, freight allowed to destination. Approx. 60 per cent contained chromium. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk..	8.25c.	8.55c.	8.95c.
Ton lots	8.75c.	9.25c.	10.75c.
Less ton lots ..	9.00c.	9.50c.	11.00c.

Ferromanganese Briquets

Contract prices per lb. of briquet, f.o.b. shipping point, freight allowed to destination. Approx. 66 per cent contained manganese. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk..	6.05c.	6.30c.	6.60c.
Ton lots	6.65c.	7.55c.	8.55c.
Less ton lots ..	6.80c.	7.80c.	8.80c.

Calcium—Manganese—Silicon

Contract prices per lb. of alloy, lump size, f.o.b. shipping point, freight allowed to destination.

16-20% Ca, 14-18% Mn, 53-59% Si. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carloads	15.50c.	16.00c.	18.05c.
Ton lots	16.50c.	17.35c.	19.10c.
Less ton lots..	17.00c.	17.35c.	19.60c.

Calcium Metal

Eastern zone contract prices per lb. of metal, f.o.b. shipping point, freight allowed to destination. Add 5c. for spot sales. Add 0.9c. for Central Zone; 0.49c. for Western Zone.

	Cast	Turnings	Distilled
Ton lots	$1.80	$2.30	$5.00
Less ton lots..	2.30	2.80	5.75

Chromium—Copper

Contract price per lb. of alloy, f.o.b. Niagara Falls, freight allowed east of the Mississippi River. 8-11% Cr, 88-90% Cu, 1.00% max. Fe, 0.50% max. Si. Add 2c. for spot sales.

Shot or ingot ..... 45c.

Ferroboron

Contract prices per lb. of alloy, f.o.b. shipping point, freight allowed to destination. Add 5c. for spot sales. 17.50% min. B, 1.50% max. Si, 0.50% max. Al, 0.50% max. C.

	Eastern Zone	Central Zone	Western Zone
Ton lots	$1.20	$1.2075	$1.229
Less ton lots ..	1.30	1.3075	1.329

Manganese—Boron

Contract prices per lb. of alloy, f.o.b. shipping point, freight charges allowed. Add 5c. for spot sales.

75.00% Mn, 15-20% B, 5% max. Fe, 1.50% max. Si, 3.00% max. C.

	Eastern Zone	Central Zone	Western Zone
Ton lots	$1.89	$1.903	$1.935
Less ton lots....	2.01	2.023	2.055

Nickel—Boron

Spot and contract prices per lb. of alloy, f.o.b. shipping point, freight allowed to destination.

15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% max. C, 3.00% max. Fe, balance Ni.

	Eastern Zone	Central Zone	Western Zone
11,200 lb. or more ..	$1.90	$1.9125	$1.9445
Ton lots ...	2.00	2.09125	2.0445
Less ton lots	2.10	2.1125	2.1445

Other Ferroalloys

Ferrotungsten, Standard grade, lump or ¼X down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa., York, Pa., per lb. contained tungsten, 10,000 lb. or more.... $1.90

Ferrovanadium, 35-55%, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. contained Va.
Open hearth $2.70
Crucible $2.80
Primos $2.90

Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal $1.50

Vanadium pentoxide, 88-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5. Spot sales add 5c. per lb. contained V_2O_5 ..... $1.10

Silcaz No. 3, contract basis, f.o.b. producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)
Carload lots ..... 25c.
2000 lb. to carload ..... 26c.

Silvaz No. 3, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy (Pending OPA approval)
Carload lots ..... 58c.
2000 lb. to carload ..... 59c.

Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over, max. based on rate to St. Louis
No. 1 ..... 87.5c.
No. 6 ..... 60c.
No. 79 ..... 45c.

Bortram, f.o.b. Niagara Falls
Ton lots, per lb. ..... 45c.
Less ton lots, per lb..... 50c.

Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per lb. contained Cb.
2000 lb. lots $2.25
Under 2000 lb. lots $2.30

Ferrotitanium, 40-45%, 0.10%C. max. f.o.b. Niagara Falls, N. Y., ton lots, per lb. contained Ti.. $1.23
Less ton lots $1.25

Ferrotitanium, 20-25%, 0.10%C. max., ton lots, per lb. contained titanium $1.35
Less ton lots $1.40

High-carbon ferrotitanium, 15%-20%, 6-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y., freight allowed East of Mississippi River, North of Baltimore and St. Louis, per carload..... $142.50

Ferrophosphorus, 18% electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equalled with Rockdale, Tenn., per gross ton $58.50

Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton $75.00

Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per lb. contained Mo. 95c.

Calcium molybdate, 40-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained Mo. ..... 80c.

Molybdenum oxide briquets, 48-52% Mo, f.o.b. Langeloth, Pa., per lb. contained Mo..... 80c.

Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per lb. contained Mo..... 80c.

Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy. Add ¼c. for spot sales
Carload lots ..... 14c.

Zirconium, 12-15%, contract basis, lump f.o.b. plant usual freight allowances, per lb. of alloy
Carload, bulk ..... 4.6c.

Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk ..... 5.75c.
Ton lots ..... 7.25c.

Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.
Car lots ..... 8.00c.
Ton lots ..... 8.75c.
Less ton lots ..... 9.25c.